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INAUGURAL MEETING OF THE 207TH SESSION

As announced below, the Inaugural Meeting of the 207th Session will take place on Wednesday, 2nd November, at 2.30 p.m. After his Inaugural Address, the Chairman of Council will present silver medals awarded for papers read during the last session, together with other awards, and at the conclusion of these proceedings tea will be served in the Library. It is hoped that Fellows will take this opportunity of meeting the Chairman and Members of Council.

TIMES OF ORDINARY MEETINGS

In accordance with a decision of the Council, certain of the Society's Ordinary (Wednesday) Meetings will be arranged to take place at 6 p.m. in the coming session, whilst other Wednesday meetings will be held, as hitherto, at 2.30 p.m. Fellows are therefore asked to pay particular attention to the times announced for each meeting in the *Journal*.

A list of all the meetings so far arranged for the ensuing session is included as a supplement to this issue of the *Journal*.

FORTHCOMING MEETINGS

WEDNESDAY, 2ND NOVEMBER, at 2.30 p.m. INAUGURAL MEETING. "This England": *Change in a Lifetime*, by Oswald P. Milne, F.R.I.B.A., J.P., Chairman of the Council of the Society. (See special Notice above.)

TUESDAY, 8TH NOVEMBER, at 5.15 p.m. COMMONWEALTH SECTION. *The British Contribution to Education in Tropical Africa*, by L. J. Lewis, B.Sc., Professor of Education in Tropical Areas, Institute of Education, University of London. Sir Christopher Cox, K.C.M.G., Educational Adviser to the Secretary of State for the Colonies, in the Chair. (Tea will be served in the Library from 4.30 p.m.)

WEDNESDAY, 9TH NOVEMBER, at 2.30 p.m. THOMAS GRAY MEMORIAL LECTURE. *The Training of Officers for the Merchant Navy*, by Captain G. W. Wakeford, M.B.E., Director, School of Navigation, University of Southampton. Captain L. G. Garbett, C.B.E., R.N.(ret.), Chairman, Thomas Gray Memorial Trust Committee of the Society, in the Chair.

WEDNESDAY, 16TH NOVEMBER, at 6 p.m. CADMAN MEMORIAL LECTURE. *The Coal-Mining Situation To-day*, by F. G. Glossop, O.B.E., Production Director,

North-West Division, National Coal Board. R. G. Baker, C.B.E., President, Institution of Mining Engineers, in the Chair.

WEDNESDAY, 23RD NOVEMBER, at 2.30 p.m. '*Learning to Read: an Experiment*', by I. J. Pitman, M.A., M.P., Chairman and Managing Director, Sir Isaac Pitman & Sons Ltd. Sir Arthur Forde, M.A., Chairman, British Broadcasting Corporation, in the Chair.

THURSDAY, 24TH NOVEMBER, at 5.15 p.m. COMMONWEALTH SECTION. '*The West Indian Sugar Industry*', by Peter Runge, Vice-Chairman, Tate & Lyle Ltd. Garnet H. Gordon, C.B.E., Q.C., Commissioner in the United Kingdom for The West Indies, British Guiana and British Honduras, in the Chair. (The paper will be illustrated with lantern slides. Tea will be served in the Library from 4.30 p.m.)

FRIDAY, 25TH NOVEMBER, at 7.30 p.m. *Film Evening*. (See programme below.)

WEDNESDAY, 30TH NOVEMBER, at 6 p.m. '*Traffic and Parking Problems*', by A. Samuels, C.B.E., A.M.I.Mech.E., M.Inst.T., Chairman, London and Home Counties Traffic Advisory Committee. Sir Richard Nugent, Bt., M.P., in the Chair.

TUESDAY, 6TH DECEMBER, at 6.30 p.m. Joint Meeting with the Institution of Plant Engineers. '*Civil and Engineering Problems of Tall Buildings*', by Sir Thomas Bennett, K.B.E., F.R.I.B.A. The Right Honble. Lord John Hope, P.C., M.P., Minister of Works, in the Chair. (The Paper will be illustrated with lantern slides. Tea will be served from 5.45 p.m.) *Fellows will require tickets of admission for this meeting.*

TUESDAY, 13TH DECEMBER, at 2.30 p.m. COMMONWEALTH SECTION. '*Sport in the Commonwealth*', by G. A. McPartlin, Senior Technical Adviser, Central Council of Physical Recreation. Harold J. Abrahams, C.B.E., J.P., in the Chair. (The paper will be illustrated with lantern slides. Tea will be served *after* the meeting.)

WEDNESDAY, 14TH DECEMBER, at 6 p.m. '*The Function of Trade Unions in Industry and Commerce*', by W. J. Carron, President, Amalgamated Engineering Union. The Right Hon. Viscount Knollys, G.C.M.G., M.B.E., D.F.C., Chairman, Vickers Ltd., in the Chair.

FILM EVENING

The first Film Evening of the Session will be held at the Society's House on Friday, 25th November, at 7.30 p.m., when the following films will be screened:

Master Farmer—Kum Yeng

A Light in Nature

The Revealing Eye

Journey into the Weald of Kent

Master Farmer—Kum Yeng (20 minutes) has gained the first Royal Society of Arts award for documentary film production in the Commonwealth. Details of the film are given in the announcement made on p. 848 of this issue of the *Journal*.

A Light in Nature (25 minutes) is a colour film produced by the Shell Film

Unit to commemorate the tercentenary of the Royal Society in July of this year. Made with the co-operation of scientists and scientific organizations throughout the world, it retraces scientific history, surveys the present scientific scene and suggests what may be the most significant advances in the years ahead.

The Revealing Eye (18 minutes), partly in black and white and partly in colour, was also made by the Shell Film Unit in connection with the Royal Society tercentenary. During the search for material for *A Light in Nature*, it was found that a wealth of fascinating film sequences existed on scientific subjects. Some of these were selected for this film album, the object of which is to show man's progress in using the camera to study motion and to point the way to future developments in this field.

Journey into the Weald of Kent (20 minutes) is a colour film produced by the National Benzole Company. With a commentary by John Betjeman, and sensitively photographed, the film shows glimpses of this part of England during the four seasons.

Tickets of admission are not required for this occasion, and Fellows are entitled to introduce two guests. Light refreshments will be served in the Library after the performance.

MEETING IN BIRMINGHAM

Fellows living in the Midlands will be interested to know that, as a result of the discussion which took place in May during a visit to Birmingham by the Chairman of Council, a first meeting has now been arranged by a local committee. It will take place at 7 p.m. on Wednesday, 16th November, at the Imperial Hotel, Temple Street, Birmingham 2, and all Fellows and their wives will be welcome. Proceedings will commence with a dinner, and this will be followed by an address by Dr. P. F. R. Venables, Principal of the Birmingham College of Advanced Technology, the subject of which will be 'The Crowther Report'. The arrangements are being made by the Provost of Birmingham, the Very Reverend Michael Clarke, and any Fellow wishing to attend is asked to inform him at The Provost's Lodge, St. Philip's Place, Birmingham 3, sending the cost of the dinner, which will be 15s per person.

RESULTS OF THE OFFER OF ENDOWED PRIZES

In accordance with the provisions of certain bequests, the Society this year offered two prizes under the terms set out below. The results of these offers are now announced:

1. *Howard Prize of £50 for Mechanical Motive Power*

A prize of £50 was offered for a treatise on some aspect of the subject of motive agents.

Three entries were received. The judge was again Mr. Julian Tritton, M.I.C.E., M.I.Mech.E., President of the International Federation of Consulting Engineers, who reported that the best essay was that by Dr. Kenneth Cochran on 'The status of the petrol engine in light road transport, with a note on improving its thermal

efficiency'. This is a very carefully worked out treatise, making a comparison between the technical and economic characteristics of diesel and spark ignition internal combustion engines. It shows the results of a close study of the latest data and various current types of engines, and draws both on published information and on tests made by the author and other recognized authorities.

The Council has accordingly decided to award the prize of £50 to Dr. Cochran. Since his essay is a lengthy treatment of a complex subject it will not be published in the *Journal*; a fully illustrated copy of it in typescript, however, will be available for examination at the Society's House.

2. *Fothergill Prize of £20 for Fire Prevention or Fire Fighting*

A prize of £20 was offered for a descriptive essay or model embodying some new idea for the prevention or suppression of fire.

Eleven entries were received. Mr. D. I. Lawson, Director, D.S.I.R. Fire Research Station, who has once more acted as judge, reported that the two best entries were a heat detector and fire alarm invented by Mr. John A. Chambliss (who submitted an example as well as a description of the device), and the essay entitled 'Rescue from crashed fired aircraft', by Mr. V. Cable.

The Council has now decided that Mr. Chambliss and Mr. Cable should each be awarded a Fothergill prize of £10.

Mr. Chambliss's invention (which is patented in the United States) consists of two sparklet-type bulbs contained in a drawn aluminium tube, which will detonate with a loud report in the heat of a fire. This detector or alarm may easily be placed in the cellars, closets or attics of a building. It has the further advantage of being relatively cheap to manufacture. The judge has suggested, however, that the use of an open mesh, in place of a solid, container would tend to make the system more sensitive. Mr. Chambliss's own description of his invention will be published in the next issue of the *Journal*. An example of the alarm may be examined at the Society's House.

Mr. Cable's essay, which will also appear in the December *Journal*, describes a demonstration (initiated and carried out by himself) in which a helicopter was employed to effect the speedy rescue of a dummy pilot from a burning aircraft.

COMMONWEALTH FILM AWARD, 1960

It was announced in the August, 1960, issue of the *Journal* that the Council had decided to institute a new award (consisting of a silver medal and diploma) for documentary film production in the Commonwealth, with the object of encouraging the making of documentary films designed for specific public purposes in their country of origin. The fields covered by the first offer of the award were those of public health and food production.

In response to this offer, entries were submitted to the Society through the Governments of eleven Commonwealth countries. On the recommendation of a specially appointed panel of judges, the Council has now decided to make the award to the Government of the Federation of Malaya as the producer of the film *Master Farmer—Kum Yeng*.

This film was made in January, 1959, for the benefit of padi (rice) planters and young farmers' clubs in Malaya. Its purpose is, briefly, to encourage the better use of land in the Federation. The film shows that a very substantial increase in the productivity of the rice-lands can be achieved by the relatively simple expedient of introducing a short-term crop. Since the introduction of the film in Malaya (where it is distributed by means of mobile cinema units) the practice of double-cropping has been widely adopted and padi production has greatly increased. Though it is not possible to assess the exact contribution made by the film to this result, the Society's judges felt that it must be a truly valuable auxiliary to other services directed to the same end. They were impressed by its artistic and technical merits, by the importance of its message, and above all by the clarity and conviction with which that message is conveyed to the intended audience.

The panel of judges was composed of the following: Mrs. Mary Adams (Chairman); Mr. William Allan (formerly Director of Agriculture in Cyprus and in Mauritius); Mr. Edgar Anstey (President, Scientific Film Association); Mr. Stanley Reed and Mr. John Huntley (representing the British Film Institute); Mr. William Sellers (adviser on films to the Colonial Office), and Sir Selwyn Selwyn-Clarke (Medical Secretary, Society of Medical Officers of Health). The Council wishes to take this opportunity of expressing its gratitude to these judges for their help and advice, and to the Central Office of Information for providing facilities for viewing the films.

Master Farmer—Kum Yeng will be shown at the National Film Theatre at 8.30 p.m. on Friday, 11th November. A small number of complimentary tickets for this performance (which is part of a Commonwealth Film Festival organized by the British Film Institute) is available for the use of Fellows on application to the Secretary. *Master Farmer—Kum Yeng* will also be included in the programme for the Film Evening at the Society's House on 25th November (see Notice on page 846).

INDUSTRIAL ART BURSARIES EXHIBITION

As announced in the July issue of the *Journal*, the exhibition of winning and commended designs submitted in the 1959 Industrial Art Bursaries Competition will be on view at the Herbert Art Gallery & Museum, Jordan Well, Coventry, from 7th to 26th November.

THE SOCIETY'S CHRISTMAS CARD

Orders for the Society's Christmas Card are now being executed, and Fellows who wish to purchase copies are requested to send in their orders without delay on the form provided at the back of this issue of the *Journal*.

NEW HONORARY CORRESPONDING MEMBER OF THE SOCIETY

The Council has appointed the following to be an Honorary Corresponding

Member of the Society in *Boston, Massachusetts*, in place of Mr. Bradford Williams, who died earlier this year:

Francis B. Morrison, M.A., 7, Douglas Circle, Norwood, Mass., U.S.A.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 10th October. Present: Mr. Oswald P. Milne (in the Chair); Mrs. Mary Adams; the Honble. G. C. H. Chubb; Mr. R. E. Dangerfield; Sir George Edwards; Mr. P. A. Le Neve Foster; Mr. E. Maxwell Fry; Mr. John Gloag; Sir Ernest Goodale; Professor R. Y. Goodden; Dr. Stanley Gooding; Dr. R. W. Holland; Mr. J. C. Jones; Mr. Edgar Lawley; Sir Harry Lindsay; Mr. F. A. Mercer; Lord Nathan; Mr. A. R. N. Roberts; Professor S. Tolansky; Mr. G. E. Tonge; Mr. Hugh A. Warren; Sir Harold Wernher and Miss Anna Zinkeisen; with Dr. K. W. Luckhurst (Secretary); Mr. G. E. Mercer (Deputy Secretary), and Mr. J. S. Skidmore (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society (the asterisk indicates that the candidate was elected a Benjamin Franklin Fellow):

Balogun, Sikiru Olayiwola, Yaba, Nigeria.
Banerjee, Pronab Kumar, Calcutta, India.
Bashkin, Professor Stanley, B.A., Ph.D., Iowa City, Iowa, U.S.A.
Birkinshaw, Donald Joseph, Barnsley, Yorks.
Briggs, Basil Ian, A.R.I.B.A., London.
Brown, Raymond Pilling, Preston, Lancs.
Buddle, Albert William, Chesterfield, Derby.
Counce, Edwin Halsall, Preston, Lancs.
*Chance, Professor Britton, M.S., Ph.D., D.Sc., Philadelphia, Penn., U.S.A.
Clarke, Stanley Leslie, Newcastle-on-Tyne.
Cleaver, Michael Alan, Pinner, Middx.
Cole, Mrs. Jill, Redhill, Surrey.
Cole, Roger Norman, Redhill, Surrey.
Cooke, Albert Kenneth, Stoke-on-Trent, Staffs.
Cosslett, Anthony John, A.C.P., Luton, Beds.
Cullen, George Henry, St. Albans, Herts.
Davies, Frederick Paul, A.R.I.B.A., Hampton-on-Thames, Middx.
Denbury, Christopher Edward, N.D.D., London.
Eccles, John Derek, Reigate, Surrey.
Falkus, Herbert John, London.
Gibb, Guy, Sevenoaks, Kent.
Hargreaves, Robert, N.D.D., Morecambe and Heysham, Lancs.
Harrison, Miss Barbara, London.
Hartley, Roger, East Grinstead, Surrey.
Hartridge, Robert James, M.A., M.Sc., London.
Hattiangdi, Gopal Shankar, M.Sc., Ph.D., Bombay, India.
Haward, James Albert, London.
Healey, Daniel Rochford, Stevenage, Herts.
Helmer, Miss Dorothy Garr, Indianapolis, Indiana, U.S.A.
Hollinshead, Kenneth, B.A., Stoke-on-Trent, Staffs.
Howard, Charles, Chichester, Sussex.
Iqbal, Muhammad Jawaid, B.A., LL.B., Pakistan.

- Irwin, James Campbell, O.B.E., E.D., F.R.I.B.A., N. Adelaide, S. Australia.
 Isaacs, David Victor, M.C.E., M.I.C.E., M.I.E.(Aus.), Pymble, N.S.W., Australia.
 James, Gwynydd Francis, M.A., North Balwyn, Victoria, Australia.
 Jenkins, Frank Illtyo, M.S.(Arch.), M.A., A.R.I.B.A., Berkeley, California, U.S.A.
 Kelsey, Peter John, A.M.I.Struct.E., London.
 Key, Archibald Frederic, Calgary, Alberta, Canada.
 Kocsis, Miss Ann, New York, N.Y., U.S.A.
 Lambert, Brian Paul, B.Sc., Rainham, Kent.
 Lightbody, Thomas Paul, M.A., Nassau, Bahamas.
 Maclean, Iain Montgomery, Purley, Surrey.
 McWilliams, Gordon George, Eccles, Lancs.
 Maitland, Stuart Austin, Vancouver, B.C., Canada.
 Marples, Elwyn Ivo Banks, M.I.Mech.E., F.R.Ae.S., Ampthill, Beds.
 Mathison, John Winduss, Leeds.
 Mercer, Terence, Harrogate, Yorks.
 Misra, Udayanath, Cuttack, Orissa, India.
 Morton, Donald, Sheffield.
 Muscutt, Harold Charles, A.T.D., Cherry Orchard, Shrewsbury.
 Noakes, Michael, N.D.D., Reigate, Surrey.
 O'Brien, Professor Cyril Cornelius, M.A., D.Paed., Ph.D., D.Mus., Milwaukee, Wisconsin, U.S.A.
 Parkes, George David, B.Sc., M.A., D.Phil., F.R.I.C., Oxford.
 Pask, Osborne Bowley, Ambo District, Ethiopia.
 Passmore, Edward, A.R.I.B.A., London.
 Perkins, Peter Noel, A.R.I.B.A., A.A.Dip., London.
 Potts, Ian Noble, N.D.D., Brighton, Sussex.
 Ratcliffe, Michael John, Wolverhampton.
 Rendell, Miss Diana Maureen Patricia Annette, B.A., Johannesburg, S. Africa.
 Rey, Joseph Marcel Francis, Quatre-Bornes, Mauritius.
 Roberts, Basil Clifford, Dewsbury, Yorks.
 Robinson, Cecil Hobson, Darlington, Co. Durham.
 Rouse, Norman Horatio, Fareham, Hants.
 Rowe, William Hindom, London.
 Ryden, Kenneth, M.C., F.A.I., Edinburgh.
 Sanderson, Robert Fitzroy, C.B.E., Melbourne, Victoria, Australia.
 Sandland, Denis Edford, Bradford, Yorks.
 Sands, Desmond Ossiter, D.S.O., D.F.C., F.R.A.I.A., Cottesloe, W. Australia.
 Scarborough, John Francis Deighton, F.R.I.B.A., F.R.A.I.A., E. Melbourne, Australia.
 Segall, Professor Harold Nathan, M.D., C.M., Montreal, P.Q., Canada.
 Slatery, Derek Matthew, Nairobi, Kenya.
 Smith, Sidney, London.
 Stanley, John Francis, Melbourne, Victoria, Australia.
 Stanners, James, Folkestone, Kent.
 Swift, Miss Agnes Hilda, Bromley, Kent.
 Tester, Gordon Thomas, Elstree, Herts.
 Thomas, Clifford Ernest, London.
 Tooley, Charles Edward, D.S.C., L.R.I.B.A., Hesse, Yorks.
 Tully, Richard Edward Jex, M.I.H.V.E., East Molesey, Surrey.
 Walber, Robert Derek, Sittingbourne, Kent.
 Walton, Walter, Sheffield.
 Westley, Professor William A., M.A., Ph.D., Montreal, Canada.

Wheeler, Edgar Thompson, London.

White, Major Clare E., M.B.E., B.Sc., P.Eng., M.C.I.M., M.E.I.C., Town of Mount Royal, P.Q., Canada.

Willetts, Albert Royden, Hereford.

Wythe, Henry George, Jos, Northern Nigeria.

Young, Mrs. Karen Garwood, N.D.D., Wendover, Bucks.

The following candidates (Examinations Silver Medallists) were duly elected Associates of the Society:

Pender-Cudlip, Miss Veronica Mary, Stratford-on-Avon.

Turnbull, Miss Janet Anne, Melton Mowbray, Leics.

The following companies were duly admitted into association with the Society:

British Nylon Spinners Ltd., Pontypool, Mon.

Arthur Guinness Son and Company (Park Royal) Ltd., London.

Henry Hope and Sons Ltd., Birmingham.

TRIENNALE EXHIBITION

It was reported that the Society had joined with other interested bodies in an appeal to the Board of Trade to make it a matter of established policy to support British participation in the Italian Triennale exhibition, held in Milan every third year.

RESIGNATION OF SIR CHARLES DODDS

The resignation from the Council of Sir Charles Dodds was regretfully accepted.

H.R.H. THE PRESIDENT

It was reported that H.R.H. the President had accepted an invitation to take luncheon with the Chairman and Members of Council on 15th December.

COMMONWEALTH FILM AWARD, 1960

The Society's Commonwealth Film Award for 1960 was made to the Government of the Federation of Malaya as producer of the film *Master Farmer—Kum Yeng*. (See separate Notice on p. 848.)

EXHIBITION OF COMMONWEALTH ART

It was agreed to give practical assistance to an exhibition of Commonwealth Art to be organized by the Joint Commonwealth Societies in London from 22nd November to 2nd December. (See General Note on p. 939.)

OTHER BUSINESS

A quantity of financial and other business was transacted.

REPORT ON THE SOCIETY'S EXAMINATIONS FOR THE SESSION 1959-1960*

INTRODUCTION

Although there exists in this country a multitude of examining bodies concerned with a wide range of specialized subjects such as, for example, 'Transportation' or 'Ballet Dancing', yet the fact is that there are, in effect, very few examining organizations of truly major importance in regard to either the diversity of their subjects or the number of their candidates. Two of the most important types of such organization are, of course, the Boards responsible for the award of the General Certificate of Education, and the Royal Society of Arts.

I have become necessarily familiar with the activities of both these types of major organization through my academic associations. On the one hand, as a university professor I am confronted each year with the formidable problem of accepting aspirants for degree courses. In spite of the fact that my own particular college sets its own Entrance Examinations, the achievements of the candidates at the Advanced Level, G.C.E., play a decisive part in securing their admission. Indeed, in many university colleges they play the decisive part, since often no entrance examination is imposed. Clearly the G.C.E. is an essential in our educational system.

On the other hand, as Chairman for many years of the Board of Governors of the Richmond Institute of Further Education, I have come to realize the cogent part played by the Royal Society of Arts examinations, especially in Further Education and in Adult Education. Indeed, the earnest desire for the R.S.A. certificates is one of the prime sources of motive power in running such an Institute. So much is this the case that one of the regular tasks of the chairman of such an Institute is to sign huge batches of certificate awards.

Undoubtedly the major bulk of the R.S.A. papers taken will always remain in single subjects. For example, whilst 65,000 subject-entries were offered at this year's R.S.A. School Certificate examinations, there were no less than 302,000 at the Society's Ordinary (Single-Subject) examinations. That well over a quarter of a million papers should be worked in one year shows what importance they have and what confidence the whole country has in the R.S.A. certificate as a reliable measure of achievement.

A cursory analysis of the subjects taken in recent years is of much interest. In the G.C.E. examinations these subjects can naturally be classed as 'academic'. In the R.S.A. Ordinary (Single-Subject) examinations the candidates primarily concentrate on commercial subjects, which necessarily also include Arithmetic and English Language, since fortunately good English is still demanded in commerce, as well as at most universities. I recall the horror of many of us when,

* A fuller report, containing lists of prize-winners and medallists, and the individual reports of the Examiners in the various subjects, will be published as a separate pamphlet by the Examinations Department later this year, and a copy of it may be obtained by Fellows on application to the Examinations Officer.

not so long ago, at one important university, it was seriously proposed to delete English Language as a necessary subject for university entrance in science! In the R.S.A. examinations English Language always keeps a firm place, second only in the number of candidates to the practical arts of Shorthand and Typewriting, and together with these two it stands well above everything else. Indeed, twice as many candidates take English as Arithmetic. This meaningful statistic might indeed well be brought to the attention of those who wish to abolish English as a subject required for university entrance. The R.S.A. examinations may yet be a stabilizer for those university experimental hot-heads, and thus focus attention on the necessity for a sound and desirable conservatism in examination practice; for the very essence of an examination system is the firm maintenance of a conservative standard over a long period of years. Let there be change by all means, but let it be very gradual.

S. TOLANSKY

ENTRIES AND PAPERS WORKED

The following table gives a detailed comparison of the number of subject-entries received for the various examinations conducted by the Society in the Sessions 1959-60 and 1958-59, and also of the number of papers worked:

Examination	Entries		Papers Worked	
	1959-60	1958-9	1959-60	1958-9
Ordinary (Single-Subject)	302,749	252,691	285,880	238,872
School and Senior School Certificates	65,610	51,069	62,991	49,745
Oral Tests	8,279	7,423	8,203	6,993
Grouped Course	29,107	31,063	28,017	30,164
Teacher's Certificate in Shorthand	1,103	818	1,087	794
Teacher's Certificate in Typewriting	616	504	609	493
Road Transport Subjects	1,232	1,282	1,184	1,232
British Transport Commission (Preliminary Examination of Candidates under Apprenticeship Schemes)	1,084	1,349	996	1,272
Royal Air Force Administrative Apprentices (Endorsement of certificates awarded by the Air Ministry)	140	68	140	68
Totals ...	409,920	346,267	389,107	329,633

GENERAL REMARKS

Once again there has been a very satisfactory increase in the number of subject entries for the various examinations offered by the Society. The total for the Session 1959-60 was 409,920 as against 346,267 in 1958-59—an increase of 63,653.

This continuing increase in the demand for the Society's examinations must surely indicate that they are meeting a need, and meeting it to the general satisfaction of local education and school authorities throughout the British Isles, as well as in parts of the overseas Commonwealth. The certificates awarded are recognized by employers as of great value in the selection, and promotion, of office personnel.

The rapid expansion of the work of the Examinations Department in recent years, however, has created many problems, especially in regard to accommodation and staff. With the use of the Exhibition Rooms in 18 Adam Street for clerical purposes during the very busy period from June to August, and the help of numerous students as temporary clerks in that period, it has been possible up till now to cope with the pressure of work, but these emergency measures will not suffice in the future as the ever-increasing demand is not solely confined to the Summer Series of examinations. The Council have therefore given detailed consideration to this problem and there is every hope that in the near future additional accommodation in the Society's buildings will be available.

ORDINARY (SINGLE-SUBJECT) EXAMINATIONS

These examinations have developed from the original scheme instituted by the Society in 1856 for members of the Mechanics' Institutes throughout the country. Now they are taken by full-time as well as part-time students, and the increased demand was spread over the four Series, the amount of the increase in each Series being as follows: Autumn, 1959—8,953; Easter, 1960—10,333; Whitsun, 1960—

12,963; Summer, 1960—17,809. It is also interesting that, with a few minor exceptions, there was an increase in entries in the three Stages of all subjects, the most popular examinations, as usual, being those in Typewriting, Shorthand, English Language, Arithmetic, Book-keeping, Commerce, English for Foreigners, and for the Shorthand-Typists' Certificates.

SCHOOL AND SENIOR SCHOOL CERTIFICATE EXAMINATIONS

The scheme of examination for the award of School Certificates has continued to create a great deal of interest. Its general purpose is the certification of a standard of attainment, in subjects of general education, appropriate to those boys and girls who leave secondary schools at about sixteen years of age without taking the General Certificate of Education except perhaps in one or two subjects. For the award of a School Certificate, candidates must pass in English Language and at least four other subjects, and the pass level is approaching the standard of the former General School Certificate examinations.

One of the valuable results of the development of this scheme is the encouragement it is giving to increasing numbers of pupils to stay on at school for the completion of a five-year course of study. In this way, the Society is helping to raise the general level of education of large numbers of school leavers, many of whom will proceed to establishments of further education. In particular, it is hoped that the School Certificate examination will tend to reduce the excessive wastage in National Certificate Courses, from which so many pupils retire in the early years mainly because they find difficulty in overcoming deficiencies in their educational background.

In 1960 entries were received from 9,173 candidates in the British Isles and 812 candidates in Nigeria: the total numbers of subject-entries were 59,981 and 5,629 respectively.

GROUPED COURSE EXAMINATIONS

For the first time for many years there was a drop in the number of subject-entries for the Grouped Course examinations—from 31,063 to 29,107. This decrease followed upon a decision of the Education Committee of the London County Council that entries from secondary-school pupils in London would not be permitted for the Grouped Course examinations, as these were designed for students of junior evening institutes.

TEACHER'S CERTIFICATE IN SHORTHAND

At the examination for this certificate in November, 1959, there were 326 candidates, of whom 149 passed in all sections and 5 were 'referred' in the Speed Test only; in addition, 17 were granted exemption from Part I. In May, 1960, there were 761 candidates, of whom 191 passed in all sections and 5 were 'referred' in the Speed Test only; in addition, 63 were granted exemption from Part I and 59 from Part II. Exemption from Parts I or II is allowed at the discretion of the Society and is conditional upon completion of the examination by the candidates within twelve months. In May, 1960, the entries included one from a blind candidate from whom special papers in Braille Shorthand were prepared; it has always been the Society's policy to help candidates suffering from this disability, and the Sub-Committee responsible for the examination were pleased that the candidate concerned passed in all sections.

TEACHER'S CERTIFICATE IN TYPEWRITING

At this examination in November, 1959, there were 208 candidates, of whom 79 passed in all sections, 21 were granted exemption from Part I and 4 from Part II. In May, 1960, there were 401 candidates, of whom 67 passed in all sections, 60 were granted exemption from Part I, and 45 were granted exemption from Part II.

EXAMINATIONS IN ROAD TRANSPORT SUBJECTS

Once again there was a slight reduction in the number of entries for the examinations in Road Transport subjects, which are conducted by the Society in conjunction with the National Committee on Road Transport Education. This scheme of training and examination originated in a conference convened in July, 1943, by the President of the Institute of Transport. It has made a useful contribution to the advancement of vocational education amongst employees of the road transport industry who were not, in the first instance, intending to proceed to higher examinations, and this contribution could be much greater if more transport undertakings took active steps to encourage their employees to take up studies under the scheme.

OTHER EXAMINATIONS

The special examinations in connection with the apprenticeship schemes of the British Transport Commission were held in April, 1960. Those for the endorsement by the Society of certificates awarded by the Air Ministry to Royal Air Force Administrative Apprentices were held in December, 1959, and March and July, 1960.

MEETINGS OF COMMITTEES

During the Session there have been, as usual, a large number of meetings of the various committees connected with the examinations, on which the Society has enjoyed, and valued, the help and advice of local education officers, inspectors of education, head teachers and specialist teachers, and of representatives of professional bodies and business organizations.

Various changes recommended by the Advisory Committees have been approved. These include a revision of the syllabus in Elements of English Law, Stage II, under the title of 'General Principles of English Law', the inclusion of Mathematics, Stage I (Elementary), at the Whitsun and Summer Series of the Ordinary (Single-Subject) examinations, and the inclusion of Arithmetic, Stage II (Intermediate), in the Autumn Series of 1961 and subsequent years.

The inclusion of examinations in Rural Science and Music in the School Certificate scheme was also approved. Although these are new subjects for this particular scheme it is of interest to note that they are not new to the Society. From 1856 to 1874 there were several examinations in Agriculture, Fruit and Vegetable Culture, Floriculture, and Gardening; and from 1859 to 1919 there were examinations in Music under various titles—Theory of Music, Elementary Musical Composition, Rudiments of Music, Harmony and Counterpoint, Harmony.

In May, 1960, a deputation from the Standing Conference of Regional Examining Unions was received at the Society's House. At that meeting it was suggested that as the speed test in Shorthand (or Typewriting) would no longer be an integral part of the examination for the award of the Teacher's Certificate in Shorthand (or Typewriting) under the revised scheme to be introduced in 1961 (details of which were published last year), the appropriate certificates of the Regional Examining Unions should be accepted, on equal terms with those awarded by the Society, for admission to the examination. This was reported to the Examinations Committee at their meeting in July, 1960, when it was decided that the appropriate speed certificates of all examining bodies on whose controlling committee the Ministry of Education or the Scottish Education Department was represented should be accepted for admission to the examinations for the award of Teachers' Certificates in Shorthand and Typewriting.

ORDINARY NATIONAL CERTIFICATE IN BUSINESS STUDIES

In May, 1960, local education authorities and principals of technical colleges in the south-east of England were sounded about the possible demand for an external

examination for the award of the Ordinary National Certificate in Business Studies, details of which were announced in Ministry of Education Circular 1/60, dated 18th March, 1960. It is understood that a number of professional bodies have agreed to accept, under certain conditions, this new certificate for exemption on a subject-for-subject basis from their Intermediate examinations. From the replies, it would appear that, whilst most of the colleges preferred their own internal examination, there was a fairly substantial minority interested in an external scheme such as the Society might provide, and a special committee has now been formed to consider this in detail.

It will be remembered that from 1936-40 the Society, acting in collaboration with the London Chamber of Commerce, offered a scheme of examinations in connection with the award of the National Certificate in Commerce and that the scheme was suspended, owing to lack of demand, after the outbreak of war.

FEES

For the examinations in 1961 and subsequent years the Council of the Society have approved an increase in the fees paid to examiners for setting papers and marking scripts and in the entrance fees payable by candidates.

DATES OF EXAMINATION—SUMMER SERIES

During the Session it was suggested that in future years the Summer Series should finish by the end of June, to avoid clashing with an industrial holiday in the first two weeks of July proposed by Trade Unions in the Midlands. Another suggestion was that no examination should be arranged for 12th July, as this was a public holiday in Northern Ireland.

It was understood, however, that the Board of Trade had appointed a sub-committee to inquire into industrial holidays, and there was a possibility that a special committee would be formed to consider the question of school terms generally, and examination dates. In these circumstances, no radical change of date for the Summer Series will be made until the recommendations of the committees mentioned above have been published, but it has been decided that in 1961 and future years the Summer Series shall end not later than 11th July.

ASSOCIATE MEMBERSHIP

Three Silver Medallists in the Society's examinations in 1959 have been elected to Associate Membership.

MEDALS

The Worshipful Company of Clothworkers has again generously contributed towards the cost of the silver and bronze medals.

GROUPED COURSE EXAMINATIONS, 1960, IN THE ADMINISTRATIVE COUNTY OF LONDON

Number of Candidates, 488; Grouped Course Certificates Awarded:

Commercial, 9; General, 1; Technical, 81

ELEMENTARY

Subjects	Passed with Credit			Passed			Not Passed			Papers worked at Whitsun and Summer combined
	Whitsun	Summer	Total	Whitsun	Summer	Total	Whitsun	Summer	Total	
Arithmetic	—	4	4	—	4	4	—	5	5	13
Arithmetic & Accounts ...	1	6	7	1	7	8	1	7	8	23
Commerce	—	1	1	1	9	10	2	12	14	25
Economic Geography ...	—	—	—	—	—	—	—	1	1	1
*English	3	—	3	56	104	160	49	140	189	352
†English Language	—	4	4	6	30	36	6	46	52	92
French	—	—	—	—	—	—	—	2	2	2
History	—	—	—	—	1	1	—	—	—	1
Mathematics	21	17	38	31	39	70	53	130	183	291
Science	24	25	49	23	38	61	18	33	51	161
Shorthand, 50 w.p.m. ...	—	2	2	—	3	3	3	35	38	41
" 60 "	—	—	—	—	1	1	1	6	7	10
Technical Drawing	18	27	45	33	83	116	13	82	95	256
Trade Calculations	—	2	2	—	6	6	3	49	52	60
Typewriting	1	2	3	5	17	22	2	30	32	57
Totals	68	90	158	156	342	498	151	578	729	1,385

STAGE II (INTERMEDIATE)

Subjects	1st Class			2nd Class			Not Passed			Papers worked at Whitsun and Summer combined
	Whitsun	Summer	Total	Whitsun	Summer	Total	Whitsun	Summer	Total	
Arithmetic	—	—	—	—	—	—	—	1	1	1
English Language	—	—	—	—	2	2	—	1	1	3
Shorthand, 80 w.p.m. ...	—	—	—	2	—	2	3	2	5	7
" 100 "	—	—	—	—	—	—	—	—	—	—
Typewriting	—	—	—	—	2	2	1	9	10	12
Totals	—	—	—	2	4	6	4	13	17	23

* English—Technical Grouped Course.

† English Language—Commercial and General Grouped Courses.

GROUPED COURSE EXAMINATIONS, 1960, AT CENTRES OUTSIDE
THE COUNTY OF LONDON

Number of Candidates, 6,775; Grouped Course Certificates Awarded:

Commercial, 137; General, 85; Technical, 2,030

ELEMENTARY

Subjects	Passed with Credit			Passed			Not Passed			Papers worked at Whitsun and Summer combined
	Whit-sun	Sum-mer	Total	Whit-sun	Sum-mer	Total	Whit-sun	Sum-mer	Total	
Arithmetic	48	20	68	27	35	62	20	47	67	197
Arithmetic & Accounts	4	13	17	25	36	61	18	50	68	146
Commerce	4	3	7	32	35	67	29	50	79	153
Economic Geography	2	7	9	52	39	91	113	160	273	373
*English	85	28	113	1,050	1,903	2,953	780	1,935	2,715	5,781
†English Language ...	34	32	66	270	328	598	107	172	279	943
French	2	1	3	8	5	13	22	80	102	118
History	1	3	4	29	46	75	28	83	111	190
Mathematics	506	772	1,278	593	1,105	1,698	875	2,019	2,894	5,870
Science	447	1,137	1,584	650	1,250	1,900	531	766	1,297	4,781
Shorthand, 50 w.p.m.	8	1	9	35	6	41	84	84	168	218
" 60 " ...	14	6	20	16	7	23	13	30	43	86
Technical Drawing ...	559	644	1,203	656	1,542	2,198	415	961	1,376	4,777
Trade Calculations ...	94	125	219	357	399	756	625	1,005	1,630	2,605
Typewriting	83	15	98	54	55	109	49	115	164	371
Totals	1,891	2,807	4,698	3,854	6,791	10,645	3,709	7,557	11,266	26,609

* English—Technical Grouped Course.

† English Language—Commercial and General Grouped Courses.

EXAMINATIONS IN ROAD TRANSPORT SUBJECTS, 1960

	<i>Papers Worked</i>	<i>1st Class</i>	<i>2nd Class</i>	<i>Not Passed</i>
1st Year—Road Transport Operation (Passenger) ...	178	39	96	43
" " " (Goods) ...	42	6	27	9
Communication and Report Writing ...	192	15	100	77
Road Transport Accounts and Statistics ...	211	31	125	55
2nd Year—Road Transport Operation (Passenger) ...	105	23	62	20
" " " (Goods) ...	38	4	23	11
Elements of Road Transport Engineering ...	52	14	23	15
Road Transport Accounts and Statistics ...	131	13	78	40
3rd Year—Road Transport Operation (Passenger) ...	56	22	32	2
" " " (Goods) ...	32	5	20	7
Road Transport Accounts and Statistics ...	57	2	23	32
Economics Applied to Road Transport ...	90	9	51	30
	1,184	183	660	341

SENIOR SCHOOL COMMERCIAL CERTIFICATE EXAMINATIONS, 1960

Candidates, 115; Full Certificates Awarded, 24.

<i>Subjects</i>	<i>Number of Papers Worked</i>	<i>Passed 1st Class</i>	<i>Passed 2nd Class</i>	<i>Not Passed</i>
Accounts	109	39	33	37
Arithmetic	84	5	23	56
Commerce	108	7	61	40
English Language	149	13	66	70
English Literature	77	7	35	35
French	28	5	16	7
Geography	36	1	17	18
History	25	—	13	12
History of the British Commonwealth	13	3	8	2
Mathematics	27	1	7	19
Shorthand, 80 w.p.m.	171	—	44	127
Shorthand, 100 w.p.m.	6	—	5	1
Typewriting	294	36	74	184
Totals	1,127	117	402	608

SCHOOL CERTIFICATE EXAMINATIONS, 1960

Candidates, 9,870. Full Certificates Awarded: School Certificate, 1,489:

School Certificate (Commercial), 1,174: School Certificate (Technical), 682.

<i>Subjects</i>	<i>Number of Papers Worked</i>	<i>Passed with Credit</i>	<i>Passed</i>	<i>Not Passed</i>
Accounts	1,890	359	735	796
Arithmetic	5,746	1,123	1,880	2,743
Art	362	44	193	125
Biology	407	37	174	196
Chemistry	504	27	175	302
Civics	958	100	476	382
Commerce	2,917	122	1,602	1,193
Cookery and Nutrition	629	91	468	70
English Language	9,604	609	5,173	3,822
English Literature	2,979	129	1,407	1,443
*French	756	65	355	336
General Science	1,810	266	958	586
Geography	4,587	144	1,333	3,110
Geometrical and Technical Drawing	3,199	867	1,518	814
†German	23	3	10	10
History of the British Commonwealth	716	9	196	511
Housecraft	52	14	33	5
Human Biology and Hygiene	387	12	150	225
‡Italian	2	1	—	1
Mathematics Paper A	4,741	825	1,435	2,481
Mathematics Paper B	3,965	717	1,286	1,962
Mechanics	479	76	168	235
Metalwork (with Drawing)	1,691	101	1,001	589
Modern British History	2,348	108	760	1,480
Needlecraft	316	60	201	55
Physics	2,251	453	870	928
Religious Knowledge	805	54	307	444
Shorthand, 50 w.p.m.	1,868	317	439	1,112
Shorthand, 60 w.p.m.	1,028	464	363	201
§Spanish	6	2	—	4
Typewriting	3,459	1,025	1,151	1,283
Woodwork (with Drawing)	1,328	178	721	429
Welsh	51	18	28	5
Totals	61,864	8,420	25,566	25,878

* 90 candidates took the oral test in French : 21 passed with credit and 25 passed.

† 1 candidate took the oral test in German and passed.

‡ 1 candidate took the oral test in Italian and passed with credit.

§ 2 candidates took the oral test in Spanish : 1 passed with credit.

ORDINARY (SINGLE-SUBJECT) EXAMINATIONS

AUTUMN SERIES, 1959, AND EASTER, WHITSUN, AND SUMMER SERIES, 1960

Subject	Stage	Papers worked	1st Class (or Passed with Credit in Stage I)	2nd Class (or Passed in Stage I)	Not Passed	Total number of papers worked in each subject	
						1960	1959
Accounting... ..	III	75	—	18	57	75	212
Advertising... ..	III	32	2	12	18	32	32
Arithmetic	I	21,593	5,063	8,328	8,202	25,466	19,405
" " " " " "	II	3,615	317	831	2,467		
" " " " " "	III	258	30	66	162		
Book-keeping	I	10,933	2,066	4,069	4,798	15,635	14,670
" " " " " "	II	3,256	993	1,195	1,068		
" " " " " "	III	1,446	45	374	1,027		
Cargo Insurance ...	III	7	3	2	2	7	6
Central and Local Govern- ment	II	121	16	37	68	121	103
Civics	I	250	38	80	132	250	104
Commerce	I	4,719	200	1,965	2,554	6,270	5,318
" " (Finance) ...	II	1,473	21	549	903		
" " (International Trade)	III	51	2	34	15		
" " (Marketing) ...	III	23	—	18	5	96	229
Commercial Law ...	III	4	—	—	4		
" " " " " "	II	73	7	36	30		
Common Law	III	23	3	14	6	31	17
Company Law	II	31	1	9	21	96	102
" " " " " "	III	48	3	28	17		
" " " " " "	III	48	3	20	25		
Costing	II	104	3	32	69	151	119
" " " " " "	III	47	—	18	29		
Danish	I	6	3	—	3		
" " " " " "	II	1	—	1	—	7	9
Dutch	III	—	—	—	—	18	11
" " " " " "	I	9	2	4	3		
" " " " " "	II	6	—	4	2		
Economic Geography ...	III	3	—	—	3	2,846	2,665
" " " " " "	I	2,531	66	577	1,888		
" " " " " "	II	194	10	78	106		
Economic & Social History	III	121	3	21	97	673	611
" " " " " "	II	526	2	200	324		
" " " " " "	III	147	1	68	78		
Economics	II	1,286	38	417	831	1,399	1,618
" " " " " "	III	113	9	41	63		
Elements of English Law...	II	316	22	105	189		
English with Literature ...	I	2,620	82	1,402	1,136	3,566	3,913
" " " " " "	II	558	10	200	348		
" " " " " "	III	388	11	232	145		
English for Foreigners ...	I	3,154	1,100	1,015	1,039	6,588	5,790
" " " " " "	II	2,975	535	1,295	1,145		
" " " " " "	III	459	43	186	230		
English Language	I	36,868	1,765	18,640	16,463	50,865	39,627
" " " " " "	II	13,135	345	5,397	7,393		
" " " " " "	III	862	14	182	666		
Esperanto	I	51	14	20	17	81	42
" " " " " "	II	15	4	8	3		
" " " " " "	III	15	6	6	3		
French	I	2,689	230	704	1,755	3,268	2,938
" " " " " "	II	436	43	105	288		
" " " " " "	III	143	6	43	94		
German	I	269	41	98	130	436	512
" " " " " "	II	118	27	44	47		
" " " " " "	III	49	6	19	24		

AUTUMN SERIES, 1959, AND EASTER, WHITSUN, AND SUMMER SERIES, 1960—continued

Subject	Stage	Papers worked	1st Class (or Passed with Credit in Stage I)	2nd Class (or Passed in Stage I)	Not Passed	Total number of papers worked in each subject		
						1960	1959	
History	I	838	18	339	481	838	899	
History of the British Commonwealth	I	103	1	27	75	376	438	
" " "	II	199	11	57	131			
" " "	III	74	1	17	56			
Income Tax Law and Practice	III	9	1	4	4	9	14	
Italian	I	237	99	93	45	367	371	
" " "	II	93	21	45	27			
" " "	III	37	5	23	9			
Law of Evidence and Civil Procedure	III	4	—	2	2	4	9	
Law of Trusts	III	7	1	2	4	7	9	
Norwegian	I	3	1	2	—	7	13	
" " "	II	2	1	—	1			
" " "	III	2	1	—	1			
Public Administration ...	III	89	1	29	59	89	140	
Real Property and Conveyancing	III	7	—	3	4	7	11	
Russian	I	103	28	33	42	139	86	
" " "	II	23	7	8	8			
" " "	III	13	3	4	6			
Secretarial Duties ...	I	1,518	105	828	585	1,518	1,131	
Shipping Law and Practice	III	20	2	10	8	20	23	
Spanish	I	319	45	95	179	477	564	
" " "	II	107	27	42	38			
" " "	III	51	4	32	15			
Statistics	II	109	19	45	45	122	125	
" " "	III	13	4	8	1			
" " "	I	—	—	—	—			
Swedish	II	—	—	—	—	1	4	
" " "	III	1	—	—	1			
" " "	I	48,997	15,493	15,056	18,448			
Typewriting	II	28,577	2,350	9,502	16,725	85,724	70,534	
" " "	III	8,150	252	1,899	5,999			
Welsh	I	17	5	11	1	17	28	
Shorthand-Typist's Certificate	Stage	Papers worked	Passed with Distinction	Passed	Not Passed	4,861	4,489	
	II	4,243	532	1,963	1,748			
" " "	III	618	35	280	303	70,472	61,608	
Shorthand :	Papers worked	Passed with Credit	Passed	Not Passed				
	50 words per minute ...	19,351	3,259	4,349	11,743	70,472	61,608	
60 " " " " " " ...	13,614	4,597	3,603	5,414				
80 " " " " " " ...	Papers worked	Passed	Not Passed	70,472	61,608			
	100 " " " " " " ...	22,338	11,130			11,208		
120 " " " " " " ...	100 " " " " " " ...	9,181	4,058	5,123	70,472	61,608		
	120 " " " " " " ...	5,362	1,976	3,386				
140 " " " " " " ...	140 " " " " " " ...	551	180	371	70,472	61,608		
	150 " " " " " " ...	46	17	29				
160 " " " " " " ...	160 " " " " " " ...	29	10	19	70,472	61,608		
In addition, the results of 2,532 papers worked at overseas centres have not yet been received							Totals	283,348

FOUR REPRESENTATIONAL PORTRAIT PAINTERS

The Fred Cook Memorial Lecture by

SIR GERALD KELLY, K.C.V.O., PP.R.A.,

delivered to the Society on Wednesday, 27th January,

1960, with Miss Anna Zinkeisen, R.O.I., R.D.I., a

Member of Council of the Society, in the Chair

THE CHAIRMAN: It is with real pleasure that I welcome Sir Gerald Kelly here to-day. As I have been told by him that there is to be no flummery about my introduction, I shall not make it very long; but if any of you have followed him round the gallery on the television screen, as I have, you will know that he is a master at interpretation and description of different artists' work. I do not know anybody who could do it better. So without further preamble I am going to ask him to give us what I expect to be a fine lecture.

THE LECTURE*

This is not the first time that I have spoken on representational painting; it is the painting that I have most easily understood, in which I still delight. I have chosen to talk to you about four marvellous portrait painters: Mantegna, Frans Hals, Velasquez and Goya. But before I begin, I should like to stake out a claim on behalf of all portrait painters. It requires great skill and extremely good training to paint a competent portrait, even if it turns out a bad one. All portraits must be representational. Think it over; the words 'representational' and 'portrait' are inseparable. The portrait painter has to define and to describe the difference between his sitter and the rest of the world. Have you got that, or shall I say it all over again?—because that is the all of what I am going to say. A portrait is a description of the difference between the sitter and everybody else in the world. For we are all of us unique. Each one of us is different. We will not talk of identical twins, who are rare and not identical!

Now not only is our appearance unique, but our sensations are also. I know what I think strawberries taste like, and I do not know how you taste them (and nor does that matter to me). When I am in Munich and stand before that great picture of *Castor and Pollux*, two splendid men on two splendid horses abducting two splendid women, the daughters of Leucippus, there, at the top of the picture, is a rosy cloak worn by one of the men against a pale blue sky, and that pink against that blue is perfectly breathtaking. Meanwhile, I do not care what my companion is feeling.

Each painter paints from his own particular prejudices, and it is through these that the quality comes. Portraits of the same person at the same age by half a dozen of the greatest portrait painters who ever lived—would they not be thrilling? But

*The lecture as delivered was extensively illustrated and has been revised for publication.

historically and geographically they are almost impossible. In fact, I have only seen two instances. In the Estense Museum at Modena, which is a lovely town, there is a half-length portrait of Frederick II d'Este, Duke of Modena; it is by Velasquez and it is a most distinguished work. About nine feet away stands a half length in white marble by Bernini of the same man at the same age: a fine Velasquez, a magnificent Bernini, both so splendid. The second example is in Rome in the Doria palace: the portrait of Pope Innocent X by Velasquez which Reynolds admired so much. It is for me the most wonderful painted portrait in the world. And in the palace they also show you Bernini's distinguished bust of the same Pope—another lovely Bernini. So you see, if you had Goya painting Queen Victoria and Velasquez painting Queen Victoria, they would be deliciously different from Winterhalter. Think that over, if you can remember Winterhalter's portraits of Queen Victoria.

I started by saying that any portrait painter had to be skilful, and oh, how skilful they were! In those happy days of the fifteenth, sixteenth and seventeenth centuries, perhaps life did not offer some mechanical advantages, but if you had talent as a painter you were apprenticed at the age of 10 or 11. There was no theatre, no newspaper—think of the time newspapers waste—no telephones, none of the interruptions brought by swift communications; you just worked, ate, enjoyed yourself, slept, and next morning you could get up and do it all over again; with the result that the great portrait painters whom I am going to talk about possessed a skill and a competence which no modern portrait painter has a tenth part of.

Now there is one other thing I should like to say about portrait painting which might be useful. When we were young, we went to church and only too rarely sang that delightful hymn,

Christian, dost thou see them
On the holy ground,
How the troops of Midian
Prowl and prowl around?
Christian, up and smite them. . . .

I will not go on with the story, but that 'prowling and prowling around' is the secret. The portrait painter faces his not necessarily enthusiastic victim, prowls and prowls around until he sees 'it', the view, or he may even find some trick of light; then he knows where and how to begin and he can start to paint the picture.

I think that the artificer, the early artist, was always and only interested in putting down what he really knew about. I do not know how many of you have been to a cave in the north of Spain, a place called Altamira—have any of you?—if you have not, well, I have been for you. It is marvellous. You go into the cave, and there, on a very uneven roof are painted bisons, darned great bisons, darned good portraits. I assure you the crowd in that cave is what my small secretary, Miss Bush, used to call 'terr-riffic'. And there is a charging pig, a young boar, whose domestic life has been interfered with by some primitive man, and he is very angry. It is worth the money to go all the way from here to Altamira to see that little pig charging. All that was painted a very long time ago. But comparatively recently, 4,000 years



FIGURE 1. *Sheikh el-Beled*
(*Egyptian, early Vth dynasty,*
c. 2450 B.C.)



FIGURE 2. *Unknown woman*
(*Egyptian, XVIIIth dynasty,*
c. 1370 B.C.)

ago, in Egypt, they made marvellous portraits, and if you were highly placed and rich enough you could order huge effigies in stone, 30 or 40 feet high. I am going to show you several of the finest portraits I have ever seen.

We know the names of these first two—Rahotep and Nefret. You notice she is made up. Do you not see how unlike everybody else they are? Now look at this one: he is the Sheikh el-Beled (Figure 1); no one knows anything about him except his name and what he looked like. It is the best portrait I know. Here is a third example: a standing figure which is in the British Museum, and you had better go there and have a look. His nose unfortunately has been broken, but I want you to look at his mouth. Can you see his mouth? Go to the British Museum and look at it: the damned thing moves! Later on I am going to show you a painting by Velasquez of a man with a rather similar mouth. Now look at that—a profile of an unknown woman (Figure 2). When you were mummified, if you were rich enough, you had a very expensive funeral and you had an extra head put in the coffin in case by any chance your real, mummified, head got damaged. Just look at that. Isn't it convincing? Do you not see how different she is from everyone you have ever seen?

The lecturer then showed five more Egyptian heads; and after these a conventional Greek bust of Pericles, then an Etruscan terra cotta of about the third century B.C., followed by seven Roman busts, a pot from South America, and two Iffé bronzes.

All this is just a prologue. Now the lights are up and you can look at each other and notice how exquisitely different you all are. If you can get that into your understanding it will help you to see what I see and delight in the pictures I am going to show you, because we now begin the Fred Cook lecture.

Mantegna was born in Vicenza in 1431 and died in 1506, so he was 75 years old. At the age of 10, he was apprenticed. An infant prodigy, he became one of the most learned men of his time. I do not think that any painter who ever lived was more gifted or more skilful. The horrible thing is that practically everything he did has been more or less ruined one way or another.

When he had been working for only 17 years he had done enough for Gonzaga, the Marquess of Mantua, to make him his Court Painter. From the age of 27 onwards, for the next 15 years, he painted a series of marvellous decorations in the Church of the Eremitani (in the Overtali Chapel) in Padua. On the left side were the five scenes from the life of St. James up to his martyrdom, and on the other side a most marvellous picture of St. Christopher. They were well preserved until, in the last war, an airman scored a direct hit, and now there only remains St. Christopher (the big one) which was saved because it had been taken out of the Chapel to be restored. I am not going to talk about that; it only makes me angry, very angry. I mean, what is the good of Mantegna having taken the trouble to paint the Chapel if someone goes and drops a bomb on it?

When I was comparatively young, about 50 years ago, I went to Mantua and there I saw a room, not a very big one, but I was not ready for it. In those days I did not use guide books. I stood in the middle of that room (no one else was there) and saw that the decorations represented a family gathering. It concerns the Marquess Lodovico Gonzaga at Mantua. His son had been made a Cardinal and had written to his father to say he would like to make a state visit to celebrate the cardinalate. So Mantegna was given the job of decorating this room to record this magnificent occasion.

You stand in the centre of the room. The walls are divided by square stone columns which turn out to be painted ones and not really columns at all. In between there are great spaces in which appear wonderful landscapes, clouds, mountains; and in the foreground, over the beautiful, carved marble chimney-piece, are grouped the whole of the Gonzaga family, mother, father, children, grandchildren, horses, dogs, everything. They are receiving a letter from the Cardinal saying, 'I'm coming to see you'. It is a magnificent scene. I know no finer family portrait, nor do I think a finer family portrait could be painted.

From your viewpoint in the middle of the room everything is in perspective. Mantegna had become a master of perspective and he was giving a perfect example of how to use it. There is the Marquess, there is his son the Cardinal. (The Cardinal looks a horrible fellow.) Turn round and there is more, more decoration; look up and the walls continue in a mass of decoration until, in the very centre, there is the painted sky, and over the edge of the round hole there is a peacock and there are girls, and some little putti (little fat cupids)—astonishing! Over the door are more of these little putti, and they are holding a splendid statement about Mantegna and who he was. Here is the portrait of the Marquess Lodovico Gonzaga



[Phaidon]

FIGURE 3. Mantegna. *Marchese Lodovico Gonzaga* (detail)

(Figure 3). Look at his ear. When I saw this for the first time, I noticed that ear was deformed and I said to myself, 'What a horrible ear, I wonder why he drew it like that'. Then in a quarter of an hour I became sensible. I said to myself 'What a fool you are! That ear is full of character, it is a blessing. He had noticed how different the Duke's ear was from everybody else's right ear, and that is good portraiture'. There is his mouth, slightly open, his teeth, his very nose, not anybody else's.

Notice Mantegna's ingenuity. All these groups are pictured as being on a slightly higher level than the spectator. You are looking up at them. You see just below each chin. It is all in true perspective, a very difficult thing to work out in those days.

It is quite expensive to go to Mantua, but you could spend your money much worse. It is a wonderful room and it was done by one man in three years. How great a skill he must have brought to the job! How marvellous to be so gifted, to be able to do it so well, so quickly. If you are ever in that room you will understand that Mantegna was a very great portrait painter indeed. He was also a very great decorator.

Because painters like Mantegna and Titian were so richly endowed they were employed by princes, popes and kings. They moved in elaborate surroundings, in towns like Mantua, Venice and Florence: a wonderful life in a most beautiful country, at a great period—the Italian Renaissance, among artistic and social activities of the highest order, and among beautiful women.

Eighty years after Mantegna's death in beautiful Mantua Frans Hals was born in Antwerp, and when he was 20 he migrated to Haarlem, both places that were geographically, materially, socially and aesthetically different from Italy. There were no palaces for him to decorate, no princes to meet, only Dutchmen all dressed pretty well alike, with huge white ruffs and cuffs and collars and large hats; and Dutch women, some of whom he must have liked.

They were an obstinate people, the Dutch, and Protestant; they had come through what might be described as a hell of a war with the Spaniards, and at long last they were free, and Frans Hals was there to put some of it down. He was one of the greatest representational portrait painters the world has ever seen. It does not matter to us that he ill-treated his first wife, that she died pitifully just in time for him to marry again and start a large family who don't seem to have done him much credit. He was very successful, he could not have failed to be magnificently successful. His sitters came from all classes of society and for more than thirty-five years he must have had a very large practice. But the end was not satisfactory. He seems to have saved nothing—it may be that his family cost a lot, that he was wasteful, that he drank—and when he was 72 he was miserably bankrupt and came to an obscure and possibly sticky end at the age of 86. What does matter is that he painted scores of the loveliest portraits of rather ordinary people.

I don't know very much else about him. He left no drawings that I know of. Here is what I think is an early picture of a Nurse and Baby. He has taken a lot of delightful care over the elaborate dress on the child, who is a marvel. How simply she is painted. I have never been quite convinced by her right hand, but the right hand of the nurse is all that it should be, and that child's dress—how solid! Here is the very well-known *Gypsy Girl* from the Louvre. This is the first Hals I ever saw to stare at. It is exquisite; rather thickly painted and wonderfully realized. She's almost tangible. (My friend Gwynne-Jones (himself an extremely good portrait painter) and I have rows as to who can praise this the most; if ever we meet in front of the darned thing we shall probably burst!) How beautifully Hals saw that snub-nosed, grinning, jolly girl, and how strikingly different she is and always will be to every other picture that I have ever seen.

The Civil Guards (remnants of the great struggle with the Spaniards) were kept up: they had their regimental dinners, enormous banquets, and they all dressed up and had themselves painted. There are quite a few such pictures by various painters, but Frans Hals did all the best of them. In one there is a lovely young man holding a pale blue flag, a most beautiful thing, it makes one's heart beat, it is like the rosy cloak against the blue sky in Munich.

In 1627 when he was about 50, Hals did *The Archers of St. George*; it is an astonishing design, or perhaps lack of design, but full of animation, of life and of



FIGURE 4. Frans Hals. *Balthasar Coymans* (National Gallery of Art, Washington, D.C. Mellon Collection)

expression. It contains eleven portraits and once again may I recommend you to look at the drawing of those ten hands. Hals did not just put a right hand on a right arm but he painted the man's own right hand; he did a portrait of each hand he painted. Hands are as different one from another as the ridges on the ends of the fingers. It should be a portrait of the man's right hand and of the man's left hand. Those of you who know the work of Sir Anthony Van Dyck (and he was doing portraits at this very period) will know how he gave each man the same genteel, elegant, clean and lovely hand. I never did believe that all the Cavaliers who followed King Charles had those elegantly beautiful hands.

Six years later Hals did an even better picture which is known as *The Officers of the Cluveniers Shooting Company*—here again the officers have got their very best clothes on—black velvet and brilliant scarves, and of course, huge white ruffs;



[Phaidon]

FIGURE 5. Frans Hals. *Isabella Coymans, wife of Stephanus Geraerds*

very difficult to harmonize, but Hals has achieved a marvel of colour: what variety—what animation—what character, and how different they are from one another. There are fourteen of them, twelve officers and two footmen walking away. There are not so many hands shown in this, but I want you particularly to see this man, the sixth from the right—I am sorry I have not got a very good reproduction to show you. Mr. Gwynne-Jones calls him 'The Wykehamist' (I wonder why). But just look at his head, his mouth is mildly open, he may have even been a little gaga. Look at the hands, the sword hilts. One recognizes that it was all done at a great pace, and I don't suppose many of the sitters wanted to pose much, but how full of individuality Hals has made each one of them. Look at head after head, hand after hand, all portraits.

Later on, when he was about 60, Hals painted the five *Guardians of St. Elizabeth*



FIGURE 6. Frans Hals. *The Women Governors of the Old Men's Almshouses in Haarlem*

[Phaidon]



FIGURE 7. Frans Hals. *The Governors of the Old Men's Almshouses in Haarlem*

[Phaidon]

Hospital. Rather a sober picture, and what a distinguished lot they were. I have heard folks say 'I don't like Frans Hals, he is so vulgar'; now I ask you—is there anything vulgar there? Look at him, look at each of the nine hands, look at that third finger. Again there seems to be no posing at all. It is all beyond criticism. Hals used a very restricted palette—his blacks were infinitely varied and silvery, and his greys and his whites full of tender colour—in a most mysterious way.

I will now show you some single portraits by him. Here is quite a small picture of *Balthasar Coymans* (Figure 4). He is a nice fellow. You may not have seen it, for it is in Washington. Again I have to say it—how well he painted hands. I will show you a picture of Balthasar's sister later on. Here is another picture—let me remind you that all these people were dressed more or less in the same kind of clothes. Can you imagine the difficulty of painting a lot of men who were all dressed rather alike? Frans Hals was able lovingly to define differences between them all. Here is *Isabella Coymans* (Figure 5)—Balthasar's sister—is she not a poppet? Hals was 70 when he painted this—this delicious master work; it's in Paris in a private collection.

I do not think anybody knows precisely what happened in the last twelve or thirteen years of Frans Hals' life; but as I have mentioned, in the material sense, his old age was not an easy one. Does it surprise you that while everything was going wrong at home, he and his genius went on painting miracles?

He was 84 when he painted these two marvels—the great Regenten groups. First, *The Women Governors of the Old Men's Almshouses* (Figure 6): five terrifying old ladies, with eight and a half hands—each one a perfect portrait. If I have a favourite, it is the one in front on the right of the picture, and her left hand.

And then *The Governors of the Old Men's Almshouses* (Figure 7); five of them, and a sixth behind them on the right (possibly a serving man, but how beautifully painted). In front of him is a dozey man in red breeches wearing gloves. Pray look carefully at his left hand in the glove, so full of fingers and thumb, put down in Hals' most magical shorthand. And next to him is a blearier old man—but most profoundly, most exquisitely understood.

Now all of you can go by Harwich and the Hook of Holland and be in Haarlem in a few hours, and you can look at these miracles. You can see those hands and the flag and the beautiful man who holds it. With the old people and the young Hals never puts a brush wrong. The tones are always true, the rare and tender colour, the blacks and whites of an indescribable elegance. You can go to Holland and back for but little money.

Frans Hals in Haarlem was about 19 years old when Velasquez was born in Seville. At the age of 14, Velasquez was apprenticed to the good Pacheco, who taught him admirably. He learned to paint with infinite sincerity, rather dry and rather hard still-lives, very highly realized (they were called *Bodogones*). He was a wonderful draughtsman.

When Velasquez was 19 the good Pacheco gave him his daughter Juana, and the young couple had two daughters, and then, when Velasquez was 23 years old, accompanied by Pacheco he went to Madrid, where the young King Philip IV liked his work and made him Court Painter. And as in the case of Mantegna, he



[Mas, Barcelona]

FIGURE 8. Velasquez. *Sor Jeronima de la Fuente*

remained attached to the Court for the rest of his life. The King's favour was of the greatest value. His office raised him above the other painters; he was independent of commissions, he could get to know anybody—sculptors like Montañes, poets like Gongora, dwarfs, buffoons, soldiers, even the Pope—he never flattered them, to him they were all equally worth while and each to him was a unique thing. I know no other painter to whom each day's painting was so fresh an adventure—his eye obstinately remained uncorrupted by experience.

Here is a marvellous portrait, painted when Velasquez was just over 20, and before he went to Madrid. She is *Sor Jeronima De La Fuente* (Figure 8). Formerly superior of a convent in Toledo, she was going to the Phillipine Islands



[Phaidon

FIGURE 9. Velasquez. *Don Diego de Acedo*, nicknamed 'El Primo'

to found the Convent of Santa Clara de Manila. Before embarking at Seville she was painted by Velasquez, in the month of June, 1620. The realization is more than careful, precise, searching—it is prodigious. The face and head seem more solid than life: the coif or kerchief round her head and the linen on her chest—too real—and oh, her hands are splendid! It is a picture of the highest quality. Need I again repeat that if you met this remarkable old woman in the flesh you must have recognized her, she is so different from everybody else.

The scholars tell us that this picture of *Don Juan Mateos, Master of the Hunt to Philip IV* (Figure 10) was painted when Velasquez was about 33—a solidly-built, stoutish man, very simply presented: the head magnificently finished, the

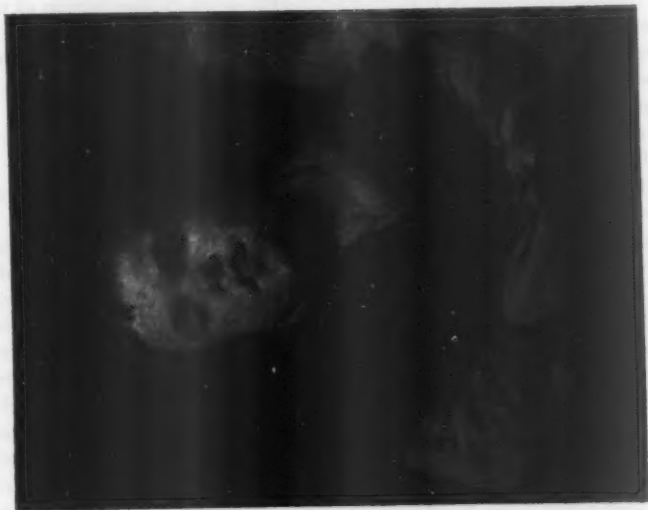


FIGURE 11. Velasquez. *El Niño de Vallecas*

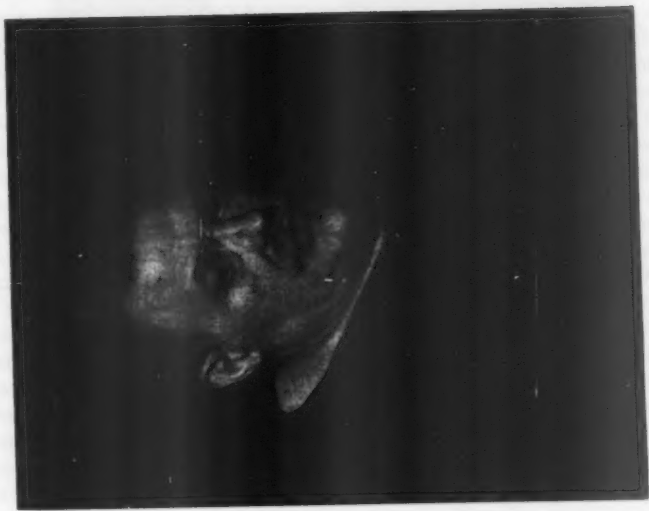


FIGURE 10. Velasquez. *Don Juan Mateos*

clothes adequate though sketchy, the hands and sword barely indicated—but what a head! There is the bone of the forehead just below the skin; we can all rub our foreheads and feel the bone just beneath the skin, and in this picture, as well as any other picture in the world, we can feel that the skull is there. It is perfection: the nose, the moustache, the wet lip, the little beard, the wrinkles in the neck—all this is perfect.

The next picture I want to show you is one of *El Primo*, a favourite dwarf of Philip IV. Again we know the exact date when it was painted—June, 1644, in Fraga. The King had gone to the front, arriving a day before a victory. Everybody was pleased and Velasquez was ordered to paint the monarch in his uniform of scarlet and silver. I have seen a photograph of the Court accounts for the adaptation of a cowshed at Fraga to be used as a studio, and it was here that Velasquez also painted *El Primo* (Figure 9). This favourite dwarf was Secretary to the Council of the Signet, and perhaps that is why Velasquez painted him surrounded with books, papers and an inkpot. Look at his hands: if Velasquez had been a careless draughtsman one would have dared to criticize these as curiously small, but Velasquez did not make that kind of mistake, so one must needs believe that this deformed little man had these tiny hands. I should like you to look and to enjoy the beautiful still-life: the large folio on his lap and a large quarto in front of him with their fine hand-made paper leaves and the vellum bindings. I don't know a more satisfactory piece of understanding accuracy than the sharp kinks there in the vellum binding. You sense that if you had been there and shut it, that cover would have chirped at you. These old vellum bindings get so dry. Look at the edges of the pages in the folio. It overwhelms one to see painting realize so much.

Now for *El Niño De Vallecas* (Figure 11): here he is, a misshapen little dwarf. It was fashionable to keep them as jesters. This picture is a supreme example of the best kind of portraiture. Look at the mass of the head—can you not see the very shape of the cheeks—how close the bone is beneath the skin of the forehead—the blob of the nose, the slack mouth, the probable halitosis? This little beast would have been quite horrible to look at, yet I have spent hours and hours in an ecstasy of admiration in front of him. Notice his hands—he is holding something in them—it must be a small pack of playing cards—now that you read it aright, do you see how beautifully the thumbs are doing their stuff? Frans Hals would have painted the hands more anatomically, the fingers would have been obviously doing their work. Velasquez just rubs in an appropriate pink and grey and there it is. Look at the head again—he is horrible, a hydrocephalic idiot. I have spent hundreds of ecstatic minutes thrilled by the beauty, if that is the right word, of this astonishing painting. Why is it that this painting of the little horror moves me to ecstasy while to contemplate the little creature himself would have probably disgusted me? Come back to the hands again—do you notice that, having established his precious pack of cards and the first finger of his right hand, the weight of the cards is safely carried? For the rest there is hardly anything there, for the second and third finger—just divine shorthand—such drawing as perhaps only the angels in heaven have succeeded in doing.

Aesopus (Figure 12) is one of the decorations Velasquez did for the Torre de la

FIGURE 12. Velasquez. *Aesopus* (detail)

Parada which the King was building. I first saw this picture in 1910. In the last fifty years I've looked at it literally hundreds of times, and every time I see it I look at that bucket. I take increasing delight in the far edge of the water. Have you ever looked at water in a bucket or in a receptacle? The surface of the water is, of course, flat, but when the water gets to the edge (I've been told it is because of surface tension or capillary attraction) it climbs up a little (this is for some reason called the 'meniscus'). What pleasure that water has given me. When next you go to Madrid please look carefully at it.

Aesop's head is superb, with his tousled hair, and his mouth is oddly like that Egyptian King's I showed you from the British Museum—the one with the broken nose. I pointed out his mouth and said I'd show you one rather like it.

The next picture, *Mercury and Argus*, isn't a portrait but a picture painted at the

very end of Velasquez's life for the Hall of Mirrors in the Alcázar at Madrid. It is the only one of four that has survived a fire and it is known to have been a long, narrow, low picture. You see, Mercury is stealing the cow Io from Argus, who was supposed never to sleep. But he is sleeping all right! I want you to look at the sleeping Argus's hands, first his right hand and then his left hand: there are no more marvellous hands in the world.

Velasquez lived amid all the etiquette and the privileges of a seventeenth-century Court and his pictures reflected the time. John Sargent, himself an admirable portrait painter, spoke of 'The conscious dignity and inviolable reserve that mark the personages of Titian and Velasquez', and how 'the quiet eyes of the older portraits held (and hold) one at a distance and seem to transpose the relation of the observer and the observed'.

He noted that Frans Hals had begun to pose his sitters less formally, and that the barrier of reverence was falling away so that gradually there entered into the art of portraiture a new quality of curiosity and analysis. It took almost fabulous technical skill to produce either a Frans Hals or a Velasquez. Velasquez died in 1660 at Madrid and Hals three years later at Haarlem.

Over eighty years elapsed before Goya was born in 1746 at Fuendetodos near Zarragossa, of a fairly humble family. As a young man he went to Madrid, then somehow got to Rome, poor, painting all the time but without success (what good could a poor unsuccessful Spaniard get out of Rome or Italy?). In 1772 he won a second prize at the Academy in Parma, but when he returned to Spain at the age of 28 he was still a failure. Then the great Raphael Mengs (who controlled the world of art in Spain) gave him (and others) the job of designing cartoons for the royal tapestries. At first Goya's designs were not very good. Soon after receiving this commission he married Josefa Bayeu, whose brother, Francesco, was a competent painter and, I think, a swell in the tapestry factory, but they had frightful rows for years.

Two years after his marriage a wonderful thing happened. The Kings of Spain—Charles V, Philip II, Philip IV—had been the most enlightened patrons and had collected marvellous things. In the year 1778 Charles III gave orders that his pictures should all be brought from the various palaces where they had been hanging and re-hung in the new royal palace in Madrid, where Goya saw his first Velasquez when he was 32 years old. Now he could study wonderful Titians, Grecos and above all Velasquez.

His production was incessant despite a lot of illness, quarrels, love-affairs—church altar-pieces, tapestry designs (the second series he did were delightful and showed the influence of the Tiepolos he might have seen in Venice), small genre compositions, and of course the eighty fantastic plates *Los Caprichos*, innumerable drawings, and a gradually increasing output of remarkable portraits. The brothers-in-law must have become reconciled, for in 1786 when Goya was 40 he painted this marvellous portrait—*Francesco Bayeu* (Figure 13). Do you want me to tell you that Gainsborough never did anything quite so good? Look at the mouth!

Goya had immense vitality and originality; he was quarrelsome but he must have had enormous charm, for he was taken up first by the Duchess of Osuna and



FIGURE 14. Goya. *Don José Manuel Romero*



FIGURE 13. Goya. *Don Francisco Bayeu*

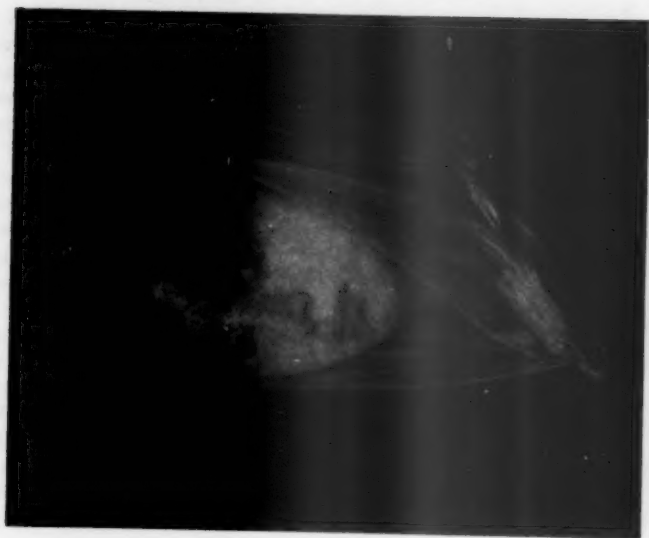


FIGURE 16. Goya.
Señora Sabasa García

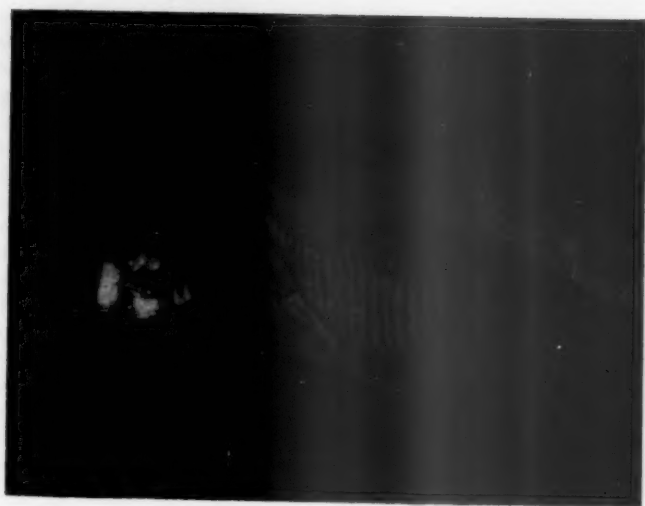


FIGURE 15. Goya. *Juan Martín*,
nicknamed 'El Empecinado'

then by the Duchess of Alba—a very great lady—the portraits he painted of her are wonderful: there hadn't been anything like them before. At one time he was so extremely ill that the Duchess of Alba (who had been exiled from the Court) took him with her to her country estate at San Lucar, where he went completely deaf. Ultimately they quarrelled and Goya added three extra plates to *Los Caprichos*, which are rather caddish. But none of all this need matter to us. We can put aside the vast amount of his other work and talk about his delicious, provocative, so characteristic portraits.

Unlike Velasquez, Goya's output was enormous. Velasquez may have been lazy (he was born in Seville); he may have been impeded by tiresome Court duties, but he was always re-touching his pictures. Goya worked quickly and sometimes carelessly. There is a picture of General Palafox on a horse which is regrettable. But when he was good he was very, very good—with always the most simple delicious handling. Starting in 1775 with the wonderful portrait of the Marquesa de Pontejos with her little pug and its silver bells, his practice never lapsed until 1827 when, nearly blind and 80 years old, he painted his last portrait. I have examined a list of 283 portraits published by Beruete and I think that 250 could fairly be called masterpieces—and who knows that the list shouldn't contain 400 items?

Besides the *Bayeu* I call your attention to *Don José Manuel Romero* (Figure 14), a Minister in his Court dress, all orders and gold lace, ribbons and crosses. Romero was, I fancy, extremely astute, and when Napoleon put a Bonaparte on the throne of Spain this fellow trimmed his country's sails successfully. He was an admirable politician, and one would, of course, have had to be very wary of him. But what character and life and guts are in that head! And here is *El Empecinado* (Figure 15) who was a commando general—very tough. How simply rendered! And as for *Señora Sabasa Garcia* (Figure 16), now living in Washington, I have chosen her because she is so pretty, so dainty, with her lovely eyes and delightful curls, all done so simply by this astonishing portrait painter. You must admit that she is a poppet!

Now I have spoken to you about four great representational painters. I have repeatedly pointed out to you that to make a representational painting of merit requires very great skill—and good afternoon.

THE CHAIRMAN: I am sure the audience feels as exhilarated as I am by this lecture. I do not think I have ever heard anything more interesting about paintings. It has taught me a great deal. Sir Gerald has done us a great honour by coming here this afternoon and delighting us, and we thank him heartily.

The vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman upon the proposal of Mr. Oswald P. Milne, the meeting then ended.

THE HOVERCRAFT AND ITS PLACE IN THE TRANSPORT SYSTEM

A paper by

CHRISTOPHER COCKERELL, M.A.,

*Director, Hovercraft Development Limited, read to the
Society on Wednesday, 6th April, with R. A. Shaw,
O.B.E., M.A., F.R.Ae.S., Assistant Director, Aircraft
Research, Ministry of Aviation, in the chair*

THE CHAIRMAN: This is something of an historical occasion. I think Mr. Cockerell may claim to be the British inventor of the Hovercraft: and certainly he is the man around whom all this work has been done here. He is to tell you about a fundamentally new form of transport, and I cannot myself think of any invention since the wheel which comes into the same class. Almost every other form of transport has its counterpart in Nature, but the Hovercraft is a really novel concept; it rides on a dynamic cushion of air and this gives it such flexibility, such freedom of movement, that it does appear to provide a completely new and potentially very important form of transport.

Mr. Cockerell is approximately a contemporary of mine. At Cambridge he took the mechanical sciences tripos, and his first job after Cambridge was with an engineering firm, where he learnt about turbines and pumps and things. After a year or two he reverted to a hobby of his, electronics, came back into Cambridge and worked for a little while in the engineering laboratory (that part of it which was called the wireless department) on electronics. From there he went to Marconi's and has in fact done a large part of his life's work until now in the Marconi organization. In 1950 he left all that, went into the country, bought a boatyard and decided to build small ships.

Well, a man with his background and capacity for thinking could not be satisfied just to build ships like other people; he had to think about ships, and thinking about them, he realized that surface friction was one of the things that held them back. He played with the possibility of putting some air under the ship, to reduce the friction to air friction instead of water friction, and in a short while he had conceived the idea of containing the air under the ship with an air jet system around the edge, and the idea of the Hovercraft was born. He was scientist enough to understand from very simple experiments what the implications of this were. After talking to a few people he came to me, and when I realized that he was offering a kind of vehicle which exploited ground effect, used ground effect to multiply the thrust of his engines, I felt that here was something very new. In the aircraft business we are now considering vertical take-off aircraft which, generally speaking, suffer from the ground effect. When they get near the ground they lose some of their lift; in fact you have to put more lift into them than they weigh in order to get them off the ground; and here was a man offering to lift a weight ten or more times greater than the thrust of the power plant that he built into his vehicle. This really was something completely new. I feel privileged to have had the opportunity of encouraging him—we placed a small contract with the firm of Saunders Roe to study Mr. Cockerell's proposals and this really was the start of the technical development of the Hovercraft.

The following paper, which was illustrated with lantern slides and a film, was then delivered.

THE PAPER

In order to be able to discuss the place of the Hovercraft in the transport system, it is first of all necessary for me to give a brief review of existing forms of land, air and water transport.

Dealing first with over-land transport, which includes air transport, one of the most important features would seem to be the size of the unit relative to its speed, and this is shown in Figure 1. It will be seen that large loads of the order of 1,000 tons are carried on railways at speeds of up to 60 knots; and that 50, 500 or more passengers are carried on the railways at speeds of up to as much as 100 knots. Technically, both the size of the loads and the speed of the units could be increased if there were in fact a need for it, but further increases of speed would not greatly decrease the door-to-door times.

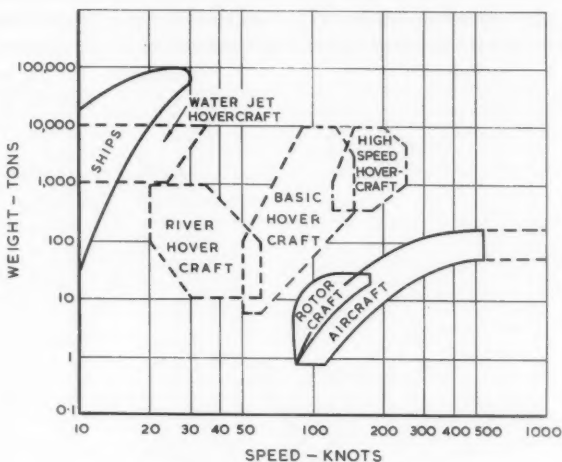


FIGURE 1. *Speed/weight envelope of civil craft operating over land*

Turning now to road haulage, it will be seen that the unit is much smaller, 5 to 20 tons being the most usual size, with about 100 tons as the upper limit in the U.S.A. Technically again, it is possible to conceive of much larger units, if the world were in need of them. The door-to-door, or 'block' speed, and the size of the passenger road-transport unit are restricted more by the degree of traffic congestion and the size of the roads, than by any law of nature precluding their further development.

The personal passenger unit, that is the motor car, of from one-half to 2 tons, dominates the land-transport scene, yielding 'block' speeds of about 20 to 40 miles in the hour. Such are the major land vehicles of a highly developed

country like Britain, if we leave out such things as motor-cycles, bicycles, tractors and canal barges.

However, our close network of railways would cost about £5,000 million at to-day's prices; and the 200,000 miles of roads in Britain represent a capital expenditure of perhaps £2,000 million to-day, amounting as they do to about $2\frac{1}{2}$ miles of road for every square mile of country. In Canada, however, there are only $2\frac{1}{2}$ miles of road for every 25 square miles of country. In Australia, the figure is 15; in Africa about 100; and in Brazil there are practically no roads. It may well be therefore, that in the less developed countries there is a case for something which we do not need to use in this country—an off-road, land or river surface transport.

It will be seen that the weight-speed envelopes of helicopters and aircraft are also shown in this Figure, and it will be noticed that on the speed scale they start where other types of land-transport stop; also that in weight there is apparently an upper limit of about 150 tons. It is thought that whereas there is a lot of development potential in terms of increased speed, the present practical

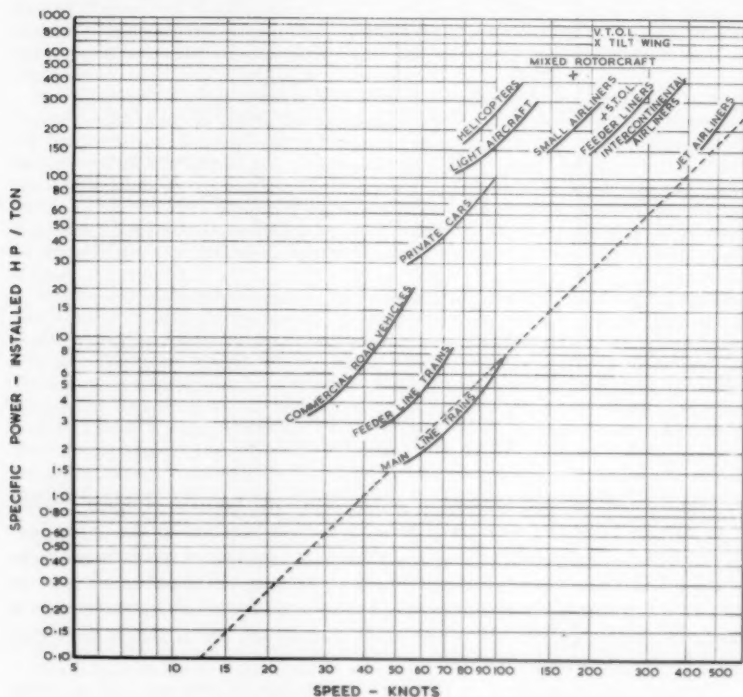


FIGURE 2. Transport systems: specific power—speed; operation over land (motor vehicles, trains and aircraft)

limit in size is of the order of perhaps 300 tons. It would perhaps be fair to say that aircraft are and will remain primarily useful for the carriage of passengers, and in general are only suitable for carrying freight over land in the absence of the other forms of surface transport.

A characteristic of transport vehicles which is of particular interest to the engineer, is the specific power-to-weight ratio. This is one of the characteristics which is important in assessing the operating costs of a given form of transport, and Figure 2 shows this for vehicles operating over land and in the air. Since air resistance increases as the square of the speed, it is not surprising to see that the specific H.P. increases at least as the square of the speed. Considering the installed-power requirement alone, railways are by far the most efficient land vehicles, due to their low rolling resistance, and the absence of steep gradients; but their relative gain in propulsion efficiency is offset by the high capital and maintenance costs of the track. Modern jet aircraft are very efficient, and helicopters very inefficient; cars and lorries, which have to be powered for hills and for reasonable accelerations, have an installed power-to-weight ratio which lies between the two extremes.

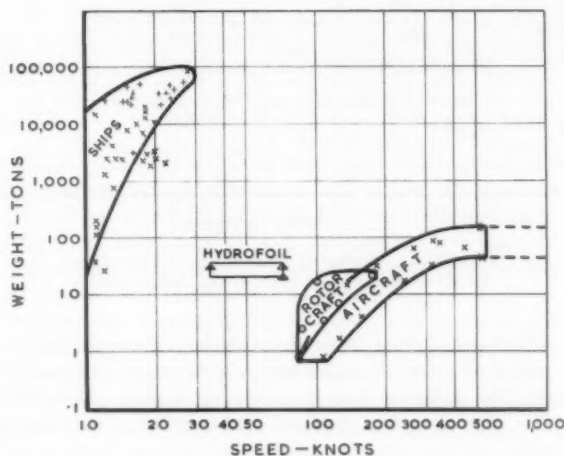


FIGURE 3. *Speed/weight envelope of civil craft operating over water*

Turning now to transport over water, the envelopes of existing forms of transport are shown in Figure 3, and it will be immediately obvious that there is a large gap in the speed range, at present only covered by a few small sheltered-water hydrofoil craft and hard-chine Naval craft. For passenger-carrying craft, this gap is from 30 knots to 100 knots, and for freight there is not only a gap in speed from 20 knots to about 200 knots, but it will also be seen that the largest

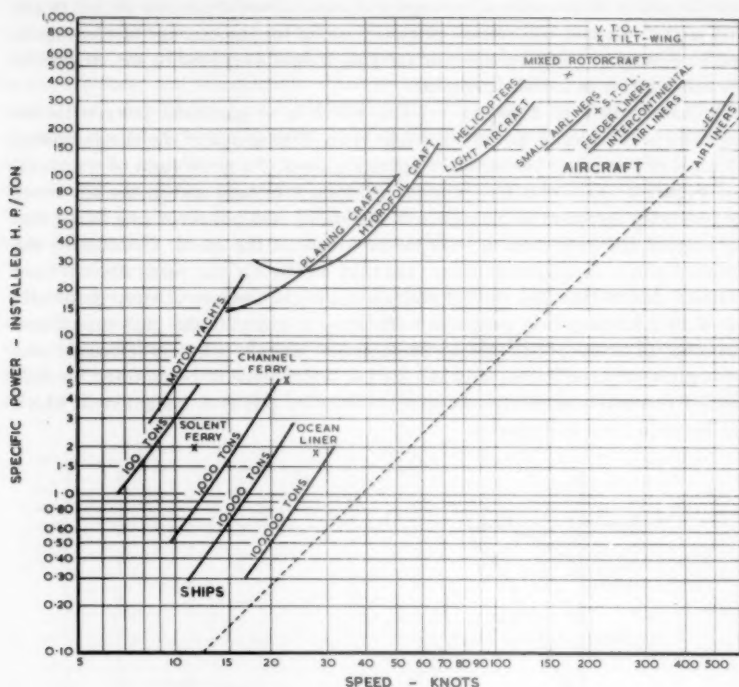
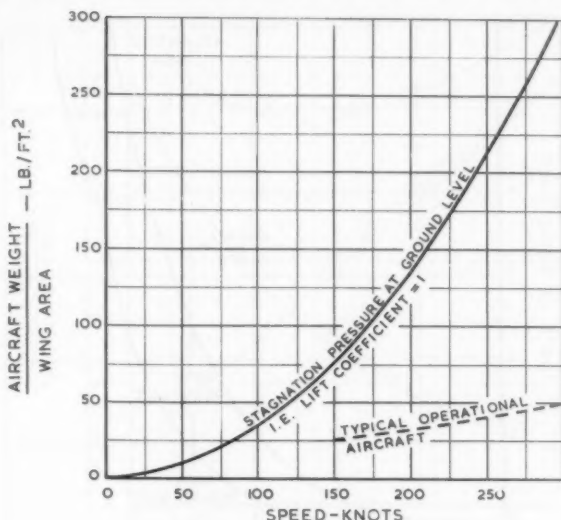


FIGURE 4. Transport systems: specific power—
speed; operation over water (ships and aircraft)

ship is almost a thousand times the weight of the largest aircraft. Man is therefore at present unable to transport large, heavy loads across a stretch of water at speeds greater than 20 knots. In terms of tonnage carried, the world's shipping still comprises more than five thousand times the cargo ton/miles accounted for by aircraft.

Figure 4 shows the propulsive efficiency for sea and air transport. Again the no-man's-land is noticeable: the low efficiencies of hard-chine craft, hydrofoil craft and helicopters putting them out of the running except for special purposes. Even if the efficiency of all these types of craft were doubled, which technically seems very unlikely, they would still not be able to compete either in size or operating costs with ships or fixed-wing aircraft.

How then is this gap to be filled? Figure 5 shows the stagnation pressure of air against speed. From this, it can be seen that an aerofoil, even with a lift co-efficient of unity, would have totally inadequate lift at speeds between 50 and 100 knots, so it is safe to say that large, slow-speed aircraft are out of the question.

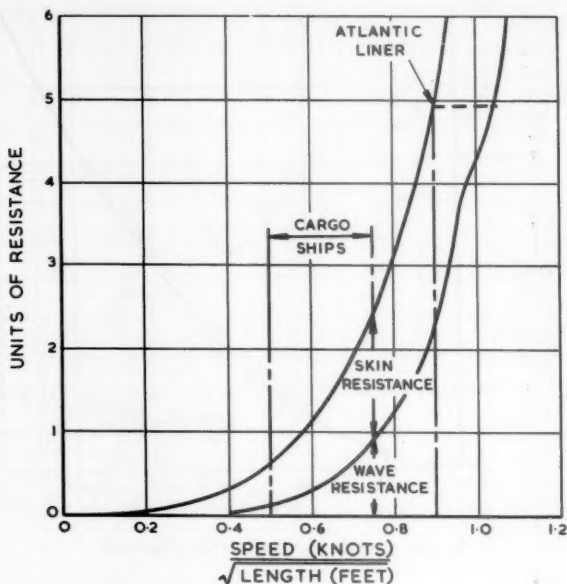
FIGURE 5. *Effect of speed on lift of aerofoil*

Helicopters have a disc loading of three to four pounds per square foot, and there is a limiting practical diameter of rotor, so that the idea of a 1,000 ton helicopter would not appear to make technical sense. Hydrofoil craft with their inadequate lift-drag ratio of 12 are capable of being developed in size, but is it possible to conceive of a craft of 1,000 tons being supported upon three or four concentrated points, with the present available strengths of steel?

Figure 6 shows the drag applicable to a ship, and it will be seen that any increase on present speeds would result in a severe drag penalty. The lower line shows the part of the total resistance which is due to wave resistance. Could this be approached by a reduction of skin friction by means of air-lubrication? On the face of it, again this would not enable the speed gap to be filled.

Figure 7 is really Figure 6 in another form, and shows a breakdown of the drag of a hard-chine planing craft against angle of incidence for a given speed. It will be seen that if some means could be found of greatly reducing or practically removing the skin resistance, by, say, air-lubrication, then the craft could be run at a low angle of incidence of 1° or less; so that the drag would be of a totally different order.

It is suggested that this is the key—the removal or near-removal of skin-friction, enabling the designer, not to try to flout the laws of Nature by trying to remove wave-drag, but to be free to design his craft in such a way that wave-resistance is of minor importance. It is believed therefore that if the speed/size gap over water is to be filled, it will be filled by craft which, while obtaining their

FIGURE 6. *Resistance of typical displacement craft*

support from the surface, are separated from it by a layer of pressurized air. It is suggested that the argument so far is irrefutable; but any arguments which now follow as to practical ways and means of achieving this layer of air come into an entirely different category, and may well become out of date as development continues.

The 'Hovercraft' is our name for the class of surface craft which rides on a layer of pressurized air, and Figure 8 shows Eggington's wave-drag envelope for this type of craft. It is based on two-dimensional theory, the normal designed operating speed being two or more times the 'hump-speed', the hump-speed occurring at $1.9 \sqrt{\text{length}}$ in knots. It will be seen that at speeds greater than twice hump-speed, the wave drag is very small. The reduction of drag at speed, however, is not the whole story. A surface-craft such as a Hovercraft will inevitably have to contend with the roughness of its supporting surface, whether this surface be land or the waves of the sea.

Figure 9 shows the path of a hard-bottomed craft, which is assumed to be travelling horizontally at the crest of severe waves. At 50 knots, it might well survive the waves of maximum probable height, but it would take to the air and crash into the worst possible waves encountered. At 100 knots, and also at 200 knots, the craft would obviously disintegrate.

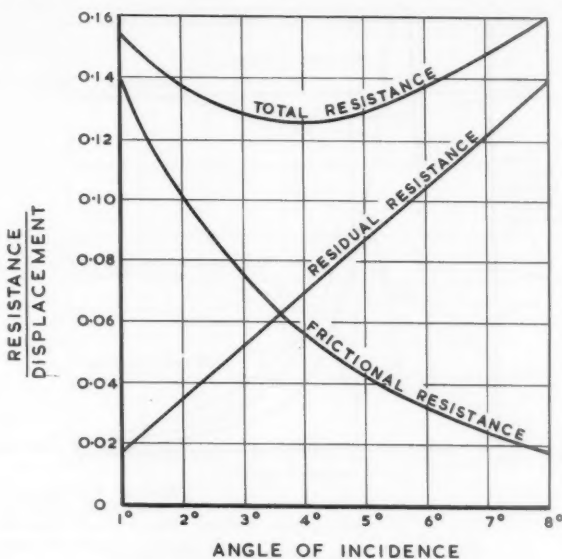
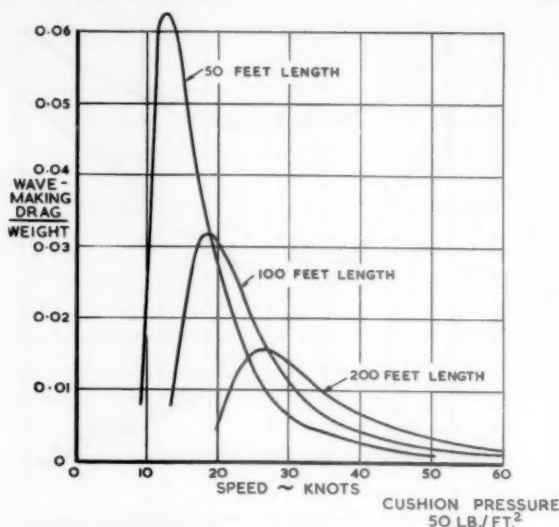


FIGURE 7. Typical resistance
of hard chine form at 40 knots

The air-layer is therefore required not only to reduce the drag, but also to be thick enough to act as an almost inertia-less suspension system. The craft must be of a sufficient size to contend with the roughness it will meet at the speed for which it is designed. Under extreme conditions, as in the case of a ship, a reduction of speed may be necessary. Waves of the order of twice craft-length or less must be cleared, necessitating a calm-water clearance of about half the height of such waves. For longer waves, the craft will tend to heave, and the really long waves can be followed, much as a car travels over the rolling Downs. (See Note immediately following.)

At this point the Lecturer showed a film covering the development and early trials of the first manned Hovercraft, the experimental S.R.N.1. constructed by Saunders-Roe for the National Research Development Corporation. This particular craft is supported by an air cushion which is sensibly static, and which is contained within curtains of moving air.

Considering again the weight/speed envelopes of land vehicles and aircraft, Figure 10 shows these envelopes together with land Hovercraft and air-bearing rail cars. A Hovercraft, like a helicopter, consumes power when hovering at zero forward speed, and therefore is inefficient at low speeds, and the minimum operable

FIGURE 8. *Wave-making drag of Hovercraft*

speed is therefore set at 30 knots. The upper limit of 70 knots is conditioned more by the type of track and by what would be safe than by any purely technical considerations. The power to weight ratio of Hovercraft vehicles within this envelope for use on prepared but unsurfaced land tracks depends upon the degree of irregularities of the track and the slopes to be surmounted. Given a track at least as smooth as a ploughed field and inclines not more steep than say three times the gradient allowable on a main line railway, then a 50 knot 100 ton Hovercraft for use in undeveloped areas might have a powering of 20-30 h.p. per ton, or very much that of a conventional lorry. Small land or amphibious Hovercraft or Hovercraft for special purposes and for off-track use, although having considerably higher powerings, would appear able to perform a service outside the capabilities of other vehicles.

The second envelope is labelled air-bearing rail cars, as proposed by Fords; and they represent the other extreme—an air-lubricated craft supported by a very thin layer of air operating on a smooth steel rail. Such craft would probably yield the best propulsive efficiency of any vehicle known, at the cost of an expensive track, but they hold out the possibility of a fast, reliable, all-weather passenger transport system between two cities, such as New York and Chicago, and might also turn out to be the commuters' dream over shorter distances, of the order of 100 miles or so. It would appear that the Hovercraft principle might also, with advantage, be applied to this form of vehicle, yielding clearances of the order of ten times that of Ford's air-bearing system, for the same expenditure of power.

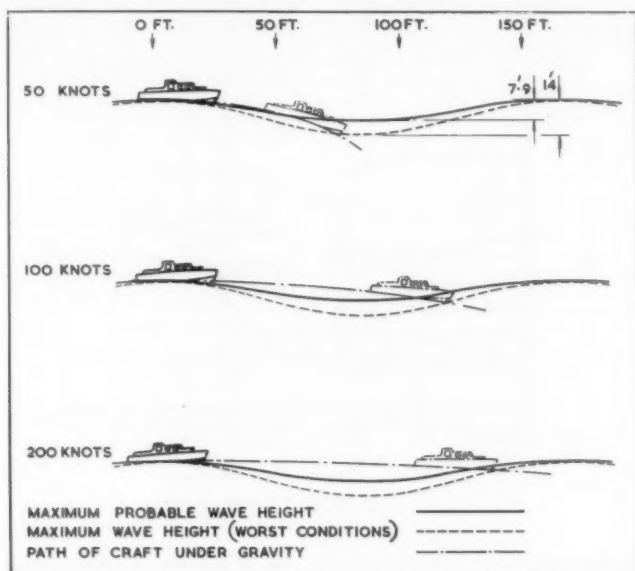


FIGURE 9. Operation of non-cushion craft in rough seas

This increased clearance would profoundly affect the cost and difficulties involved in constructing and maintaining a suitable track.

Returning now to over-water craft, Figure 11 shows the weight/speed envelopes of ships and aircraft together with the envelopes of the various kinds of over-water Hovercraft which can be envisaged. In the speed range 10 to 30 knots, and weight range 1,000 to 10,000 tons, the envelope of a side-wall Hovercraft with water jets is shown. Such cushion-borne craft do not encounter the problems associated with high speed over rough water and while being operationally attractive in their own right, also serve as a useful stepping stone in the full exploitation of the speed capabilities of open-water Hovercraft. Little work has been done on such craft, but it is hoped that their inclusion will stimulate thought.

The next envelope in the speed range 20 to 60 knots and 10 to 1,000 tons is for side-wall river Hovercraft, which would appear to be both practicable and promising. It would not be safe to attempt to operate large river Hovercraft at speeds in excess of 40 knots in any but a few of the world's rivers, because of the normal presence of other smaller craft.

The best speed for sheltered-water and Channel ferries would seem to be in the range 70 to 120 knots, and this range is covered by the basic Hovercraft envelope. In this speed range, air-propulsion and air-jets come into their own, and it is

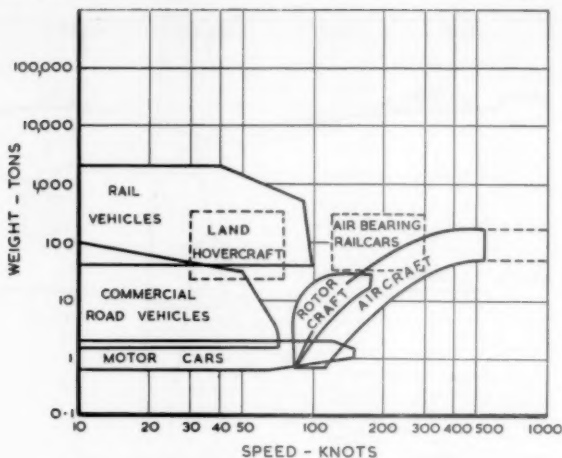


FIGURE 10. *Speed/weight envelope of civil craft operating over land*

thought that, after many years, there will also be open-water, ocean-going craft in this category.

At speeds above about 130 knots, aerodynamic lift begins to be an important factor, so there may be another category of high-speed Hovercraft which travel higher, up to perhaps 40 ft. calm water clearance, but which are at all times partially 'cushion-borne'. Such craft, due to their speed, would be unable to follow even comparatively long waves, and therefore would on that account have to travel higher, and in consequence would also have to be large.

This survey would be incomplete, however, without mention of the cushion-cum-aircraft combination which Mr. Frost of Avro-Canada has been working on for some years.

At present, aircraft use wheels for landing and for take-off. It is interesting to speculate what the effect would be on the performance, and more particularly on the maximum practicable all-up weight, if a cushion landing-system were substituted, the aircraft remaining partially cushion-borne up to speeds of perhaps 200 knots. Will a cushion landing-system and an atomic power-unit eventually make practicable a really heavy inter-continental air-freighter with wing-loading of perhaps four times normal practice?

Such then is a brief outline of the very wide field covered by the air-cushion concept, in these early days of development. Of all the apparently possible types, only the Basic Hovercraft in the speed range 50 to 120 knots and in the weight range 2 to 1,000 tons, has been looked at in any detail.

Before attempting to give some indication of possible operating costs, it is of interest to investigate the density of the loads which best suit the various forms of

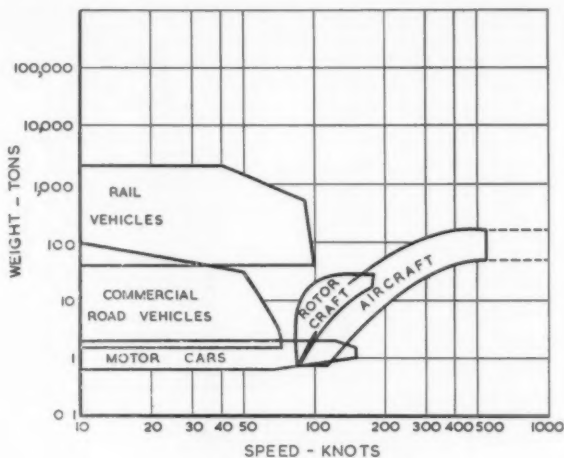


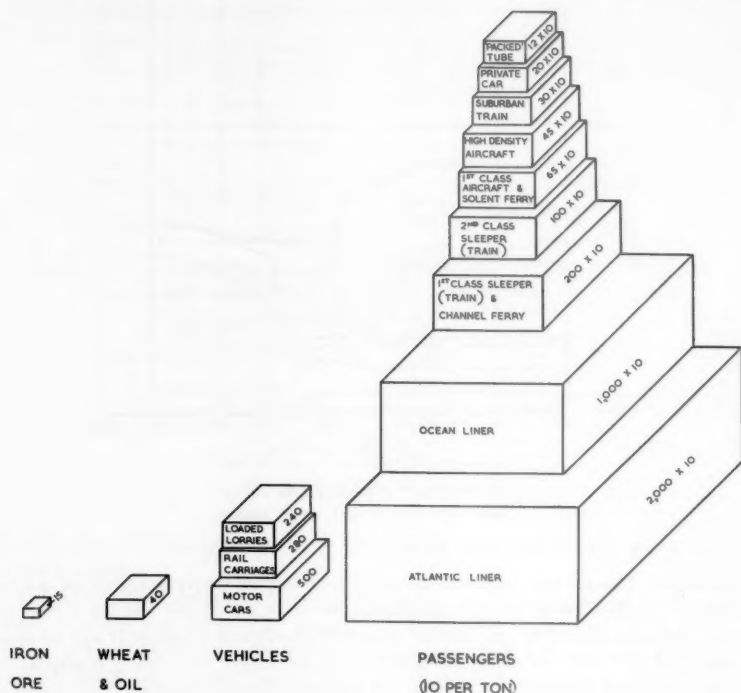
FIGURE 11. *Speed/weight envelope for Hovercraft over water*

transport. The volume required for one ton of representative loads is set out in Figure 12. The range is quite enormous, from 15 cu. ft. per ton for a load of iron ore to 20,000 cu. ft. per 'ton' of passengers and their baggage. It will be seen also that the range of space allocated to one passenger in existing transport is also very great, from about 12 cu. ft. per passenger for an uncomfortable crowded Tube train to some 2,000 cu. ft. for an Atlantic liner. The minimum space required for comfort is related to the duration of the journey, and a fair minimum would seem to be 60 cu. ft. for journeys of up to about 3 hours, and 200 to 400 cu. ft. for an overnight or 24-hour journey.

Ships and atomic submarines are at their best when carrying dense loads, such as oil or wheat, which require about 40 cu. ft. per ton, the payload then being a large proportion of the displacement. As a passenger carrier, a liner only carries one passenger for every 20 to 40 tons of displacement, and the figure for a Channel ferry is about 2 tons per passenger, so that even here the payload is only about 5 per cent of the displacement. A load of motor cars is about one-tenth of the density of oil or wheat, and so cars are not a suitable load for a ship.

The figures for aircraft vary from about one-third to two-thirds of a ton of all-up-weight per passenger, depending upon stage-lengths, so that the passenger payload is in the range 10 per cent to 20 per cent of the all-up-weight; hence aircraft are better suited to passenger-carrying than are ships. This is shown in Figure 13.

Basic Hovercraft of 100 tons or more will have cushion loadings of 50 to perhaps 150 lb. per square foot of plan area, and about two-thirds of the plan

FIGURE 12. *Volumetric capacity of payloads (cu. ft./ton)*

area will be available for accommodation. The average car of about $1\frac{1}{2}$ tons requires about 100 sq. ft. of plan area giving a loading of 22 lb. per sq. foot based on craft plan area. At least 10 passengers and their luggage can be accommodated for short durations in 100 sq. ft. giving a loading of about 14 lb. per sq. ft. of craft plan area. Such loadings are very suitable for Hovercraft, and it will be seen from Figure 13 that the passenger payload can be very high for a short-range Hovercraft ferry.

The next thing to consider is the specific power requirement of basic Hovercraft, and this is set out in Figure 14, where it is seen that the Hovercraft power envelopes are located in the empty space between ships and aircraft. It is apparent and indeed a fact that Hovercraft, like ships, become more efficient as they become larger.

The total power required for a Hovercraft is made up of that required for lift and that required for propulsion. The specific lift power decreases with increases in craft size, but increases with clearance height, and therefore with the range

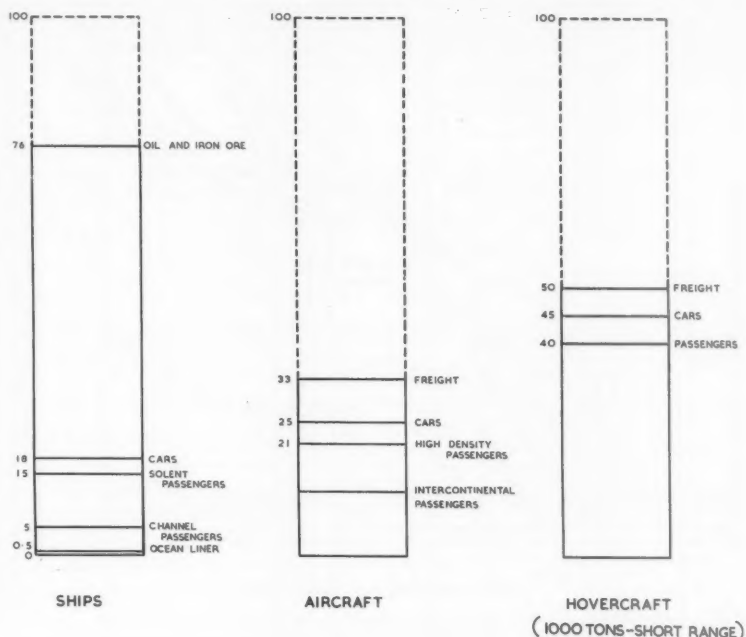


FIGURE 13. Payloads as a percentage of maximum loaded weight

of wave conditions with which any given craft is designed to contend. However, very considerable improvements in lifting efficiency may be expected, not of the order of 5 per cent or 10 per cent., but of the order of two or three times, for large craft during the course of development. Such improvements are already a reality in the laboratory.

The power required for propulsion is largely used to overcome the air-drag associated with pushing the craft and the air-cushion through the air; but, and depending upon the design, there may be some water-skin-friction drag under adverse sea conditions. These are the dominant drag components, for in general Hovercraft may be designed so that the wave drag is negligible at cruising speed.

As to costs, let us consider first the capital cost of a Hovercraft. Small Hovercraft of 2 to 100 tons will have refined structures, and their costs are likely to be high, but Hovercraft of 1,000 tons or more will have structures with $\frac{1}{4}$ in. or $\frac{3}{8}$ in. light alloy plating, and will be much more akin to a ship than an aircraft. The ship-building industry can fabricate and finish a light alloy ship's superstructure for about £500 per ton. An equipped air-frame costs of the order of £20,000 per ton. There is therefore a difference of at least 40 to 1, based on weight, between the

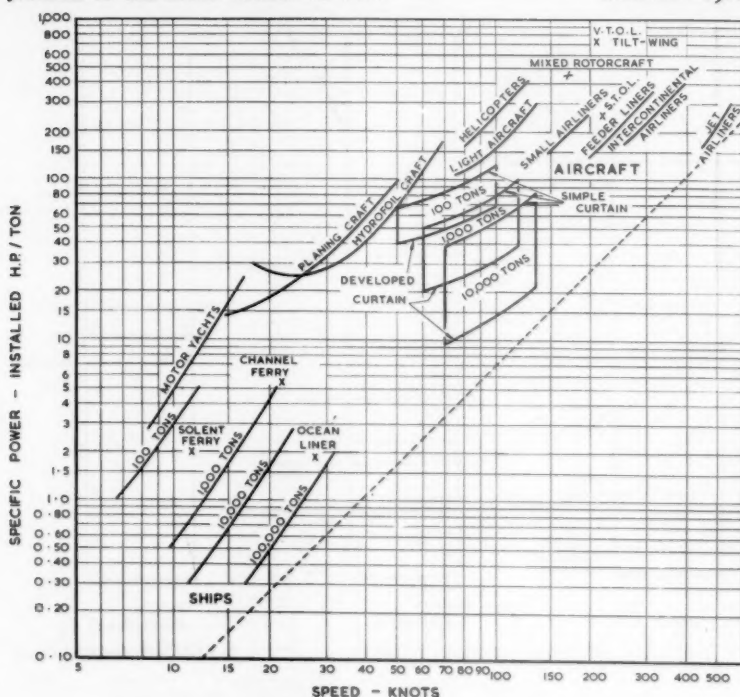


FIGURE 14. Transport systems: specific power—speed (ships, aircraft, Hovercraft)

cost of a one-off ship's superstructure and a batch of equipped air-frames. This difference is so great that any estimate of a Hovercraft first cost can only be approximate. If the cost of the structure of a 1,000-ton hovercraft is based on £4,000 per ton—that is eight times more than that of a light alloy ship's superstructure, and five times less than that of an air-frame—then the cost of the complete 1,000 ton ferry is estimated to be £4 million. Such a craft would do the work of 5 or more 3,500 gross ton Channel ship ferries, costing £1 million each.

The estimated direct operating costs per passenger mile at 60 per cent load factor of such a Hovercraft ferry is shown in Figure 15, and may be compared with the direct operating costs of ship ferries, aircraft and helicopters. It will be seen that its only competitor over short stage lengths is the much slower ship ferry.

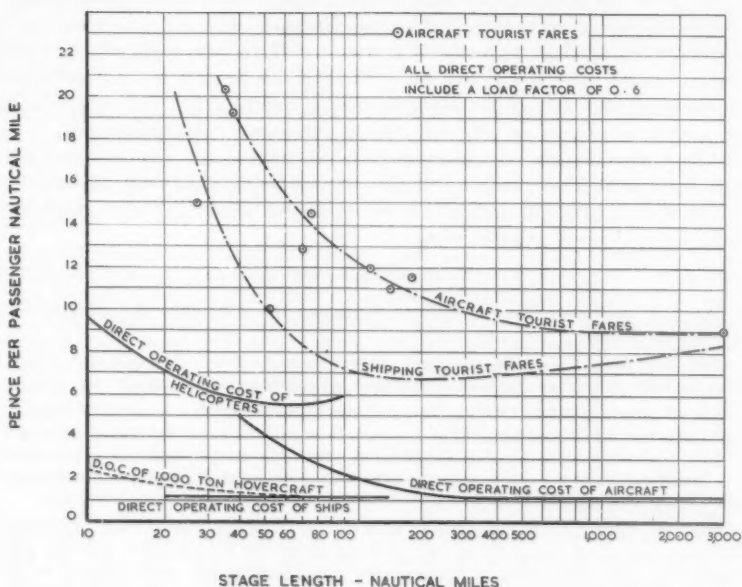


FIGURE 15. Effect of stage length on fares and direct operating costs

operating costs, using an appropriate load factor such as the 60 per cent used in these curves. However, if the direct operating costs are doubled in this way, and compared with the fares which are charged, the figures would show a profit figure of 200 or 300 per cent, which is not achieved in practice, and it is therefore necessary to consider other factors. Where a series of ship ferries are operated over a stretch of water such as the Solent, or the English Channel, the fares are based more upon the cost of operation over the longer routes than upon the cost of operation on the shorter routes, and so tend to be standardized. This has the effect of making the fares charged on the shorter routes—for example, Dover to Calais—appear very high on a mileage basis—and in fact, so high in this case as to enable aircraft to compete for the traffic.

All these routes suffer from the seasonal nature of the traffic, a situation which would be greatly helped if road-transport were attracted to make more use of the service. However, certain fairly firm conclusions can be drawn.

1. The capital cost of the 1,000 ton Hovercraft ferry is about the same as the capital cost of the five ship ferries required for doing the same work.
2. The operating costs of the undeveloped Hovercraft at 70 to 100 knots are very similar to those of a ship ferry operating at 16 to 20 knots.
3. Neither the aircraft nor the helicopter can compete on short routes.
4. The capital expenditure for a fleet of aircraft to do the same work as

one 1,000 ton Hovercraft for short routes would be three or four times greater than for the equivalent Hovercraft or ship ferries.

This rather detailed discussion of a particular Hovercraft application has led away from the main theme. The main theme of this paper is to focus attention on the speed-and-size gap in existing over-water transportation, and to show that existing vehicle forms are incapable of being developed to bridge this gap.

The paper then sets out an argument which leads to the statement that, 'If this gap is to be filled, it will be filled by a new type of "super-surface" vehicle, which, while obtaining its support from the surface over which it travels, is separated from it by a layer of pressurized air'.

DISCUSSION

MR. P. K. SHAHANI: Did the lecturer encounter any difficulties in exploiting his invention?

THE LECTURER: I suppose the short answer must be 'yes'. Any job of work is fraught with difficulties and it is always very difficult to put over a really new idea.

MR. G. VIVIAN DAVIES: I should like to ask the speaker why in the model he has not used any form of streamlining? It is very square in front. I have seen the actual craft. Why does he not make a curved or pointed front? My second question is, has Mr. Cockerell gone into the comparative costs of a Channel tunnel, a Channel bridge and the use of Hovercraft?

THE LECTURER: The first question is, why we did not streamline it? Well, of course, in newspaper terms one of the intriguing things about the Hovercraft is that you can make it go fast. But in fact, it is the ability of the craft to get off and get up at no speed at all which is the real thrill when you know the problems, because water is then at its softest. Once you get going fast enough, water behaves like a piece of concrete. So we were not particularly interested at that time in speed and streamlining but rather in demonstrating the craft's ability to lift its 4 tons of metal clear of the water. Later models will certainly have much more streamlined shapes, in keeping with their greater speed.

Now on Channel transport, obviously a tunnel or bridge can only be contemplated where the Channel is narrow, namely between Dover and Calais. On the longer routes the choice will be between ships, Hovercraft and aircraft. On the Dover to Calais route, on the question of relative costs (and these are not the only considerations), the correct choice depends almost entirely on the amount of traffic, and this is very difficult to estimate, as in large measure the new facility, if it is sufficiently attractive, creates and increases the traffic.

There is not enough traffic at the moment to be able to contemplate an expenditure of upwards of £100 million on a Channel tunnel, but there is enough traffic to contemplate the expenditure of a tenth of that sum on the development of a Channel Hovercraft, and such an improved system would enable future traffic trends to be predicted with greater accuracy. At some future date when the traffic has built up to about ten times its present size, a fixed facility (and I would vote for the bridge) would be the right thing, but up to that time, suitable Hovercraft would be capable of carrying the increasing load, and operating more economically than either a bridge or a tunnel. On the longer routes Hovercraft would continue to be operated.

MR. A. POWIS BALE: As a mechanical engineer I welcome this remarkable paper, but I have a question which I feel may cramp Mr. Cockerell's style a little. It seems that the ratio between engine power and payload is rather high. I should like to know whether he hopes to reduce this in the future? In other words, it seems that for the power he is not carrying enough payload.

THE LECTURER: Are you talking about the existing Hovercraft?

MR. POWIS BALE: Yes. My other point is this: Mr. Cockerell demonstrated remarkably what it could do on good terrain. Now I visualize such a machine doing good work out in the outback of Australia where communications are extraordinarily difficult; but of course the real difficulty there arises in this quick-growing scrub. You have only got a lift of, say, fifteen inches, and this scrub may be cleared away fairly quickly but it pops up again equally quickly. Again, on the sea: Mr. Cockerell showed us ordinary waves. Now what happens if you get a breaker wave, about six feet high? Would it not tend to wreck the whole contraption? Finally, when the craft goes over desert, what happens when it lands there, with the loose, not wet, sand?

THE LECTURER: Well, I think the speaker wants about a million pounds worth of information! On the power story you must consider the S.R.N.1 as an experimental craft. It is nearly as good as the latest Admiralty hard-chine boat, and that is not bad for a first effort in eight months. In introducing a new form of transport we have to compete straightaway with forms of transport which have had many millions spent on them, over many years of development. This is a formidable task, so you must bear with us for a bit and not expect the experimental prototype to be competitive.

As to Australia and the scrub, I do not know how tough this scrub is, but I should think that a Hovercraft, weighing as it does a number of tons, would just go right through it. I do not think we need worry about scrub, but I do think we need to worry about stray rocks which may be sticking up.

In answer to your question about waves, the craft must be designed to be able to operate over the height of waves which it may meet on any specified route. The hover-height, which was designed to be 15 inches in the case of the S.R.N.1, is a function of the size of the craft. For instance, a Channel Hovercraft would have to be designed to be quite happy over about 12-foot waves, in order to operate to an advertised time-table for 98 per cent of the time. The question of hover-heights is considered in more detail in the written paper.

We know very little about sand, but the performance over sand does depend a great deal on the method adopted to contain the air cushion. This is a problem which will have to be tackled.

MR. J. LLOYD OWEN: May I ask three questions? Firstly, a military vehicle, particularly for crossing rivers, would have to be able to surmount very steep banks. What is the steepest angle the Hovercraft can climb—both theoretically and practically? Secondly, a military vehicle must have great endurance and reliability in adverse conditions. How long have the engines of the Hovercraft been run in its self-created dust and water storms? The third question is (having missed the early part of the lecture), am I right in thinking that however much you develop the Hovercraft, the downward thrust needed to raise it on its cushion can never be less than the dead weight of the machine? How does the thrust in pounds per pound weight of the vehicle, needed to float the Hovercraft, compare with the thrust per pound weight required by a motor car going at 60 m.p.h. and a motor boat going at 30 m.p.h.?

THE LECTURER: To take the second question first, the problem of keeping sand and sea water out of the engines will have to be taken very seriously, but it is not peculiar to Hovercraft. Such problems have had to be faced and solved for other vehicles, for example the latest Naval craft, which is driven by three gas turbines.

On the question of a Hovercraft climbing banks, a 10-ton Hovercraft, a 10-ton truck and a 10-ton fighting vehicle all require the same thrust to surmount a given incline. It would not be economically sensible to design a Hovercraft to be capable of climbing steep hills. When the railway engineers designed the railways they decided that a gradient compromise proper to a railway was one in three hundred

for a first-class line. If they had put two engines on to the train, they could have allowed themselves a steeper gradient. The same applies to a Hovercraft. If you like to put enough power in it you can make it do fancy things, but if you do, it is an expensive and uneconomical vehicle. However, there might be a case for fitting much bigger engines in a military vehicle.

MR. J. LLOYD OWEN: Is there not a limiting angle beyond which you cannot climb, because the flotation thrust begins to resist forward progress?

THE LECTURER: I do not think so.

THE CHAIRMAN: I think it might be helpful if Mr. Cockerell explained to the speaker that the thrust of the edge jets is on the average much less than the weight of the vehicle. That is in fact the virtue of the Hovercraft vehicle. You use an edge jet, which is a distributed thrust around the edge, to contain an internal pressure which collectively multiplies the thrust of the edge jet by the order of ten. So the adverse thrust which is really used in hill climbing is of the order of one tenth of the weight. Now if you are clever and deflect the thrust a little bit back—which you might well be able to do without losing your cushion—you do not even get an adverse effect at all.

MR. LLOYD OWEN: Then the flotation thrust need only be about a tenth of the weight?

THE CHAIRMAN: It might be less.

DR. G. S. HISLOP: I would challenge Mr. Cockerell on his optimism with regard to the development costs, because I am quite prepared to disagree with his reply to the previous question, namely implying that weight is not so terribly important in this vehicle. There is going to be tremendous pressure to keep the weight down; this is one of the reasons why aircraft development costs a great deal more than ship development, where weight does not have such a direct effect on performance. So I think that, although on the face of it the multiplication by five of the cost per thousand tons for a ship may seem on first sight to be generous, it is misplaced optimism to think that the cost will be a small fraction of the cost of an aircraft of the same weight.

Secondly, I think that it is a very highly selective vehicle because it is very sensitive to the nature of the terrain over which it is flying. In the opening up of undeveloped territories, for example Brazil, which has extensive forest, I think that the problem of flying over forest might be very serious because Hovercraft cannot develop and maintain the necessary pressure cushion beneath the machine unless it becomes enormously large, so that the height of the trees is small in relation to cushion height—virtually an impossibility. Also, the Hovercraft would be very seriously limited as a military assault craft, for example, as it would be unable to surmount steep hills, or even relatively low cliffs. Military assault, of course, favours such terrain for its operation in view of the vulnerability of an attack if conducted over level terrain.

Finally, Mr. Cockerell has optimistically suggested speeds of the order of 100 or even 200 knots. This means the vehicle must be generating considerable aerodynamic lift, drag and moments at such speeds. What thought has been given so far to the fundamental aerodynamic problems involved in flying very close to the ground—or water—at such high speeds, bearing in mind that even momentary contact of any part of the vehicle with the earth's surface could have disastrous consequences?

THE LECTURER: First, on the question of cost. I have not been able to obtain the cost of an aircraft fuselage if you take the undercarriage off, the wings off, the tail off and the tail fin off, and you are just left with the bare fuselage. That is the sort of cost that you have got to scale in terms of a Hovercraft.

Again, and provided one is considering large Hovercraft of 1,000 tons or so, one will be dealing with much thicker gauges than are found on any aircraft fuselage, so

that the pounds of metal per rivet or man hour will be much greater in the case of the Hovercraft than in the case of an aircraft, and this will result in a lower cost when expressed as so much per ton. Also, the shape of a Hovercraft will be more square and more simple than that of an aircraft fuselage.

DR. HISLOP: Not for a 100 knots surely?

THE LECTURER: For a 100-knot Hovercraft of a reasonable size the shape is likely to be an elongated cube with the corners knocked off, in the direction of a streamlined form.

Every bit of the craft requires a new engineering compromise and the relative weight of each design factor is entirely different from the factors which determine the design of an aircraft. This will take time, because no existing part of industry has exactly the right compromise built into its organization at the moment. For example, we shall require a cross between the quality and weight of an aircraft and a 'bus seat, an aircraft and a ship engine, an aircraft and a ship radar, and so on.

I am afraid I do not know very much about Brazil, but I seem to remember that there are twenty-three thousand miles of navigable rivers. A lot of those rivers are of the sort which is a bit precarious for boats and probably very suitable for Hovercraft.

With regard to the last point, let me say that we do not contemplate land Hovercraft operating at speeds of 100 or 200 knots except on prepared tracks, when speeds in excess of 200 knots would seem to be quite practicable.

Aerodynamic forces begin to be a factor at 100 knots and a most important factor at 200 or more knots. The basic Hovercraft of 70 to 140 knots over water is, however, riding on its air cushion at all times and is tied to the surface, for it cannot take off like an aircraft. The problems are therefore more akin to the suspension problems of a motor car rather than those of an aircraft. The changes in aerodynamic forces and moments associated with pitch and roll of a Hovercraft are small compared with the cushion forces, consequently (unlike the case of an aircraft) a change of attitude has a very minor effect on the path of the craft. Further, the cushion lift can be made very sensitive to hover-height. Hence the cushion forces are the controlling ones and we have a very powerful tool to hand in our ability to move and control the centre of pressure of the air cushion. The forces which may be brought to bear in this way are far larger than the total thrust of the lifting jets.

We must, however, learn to walk before we try to run.

MR. W. R. MERTON: May I ask what sort of acceleration and manoeuvrability is foreseen for the proposed 1,000-ton craft?

THE LECTURER: I think the thrust required is of the order of 60,000 to 80,000 lb. per 1,000 tons, which gives you the order of the forces at our disposal. In other words a large Hovercraft is very bad at accelerating, fairly good at stopping, if it uses water brakes, very bad at turning corners, and therefore is not a particularly manoeuvrable form of vehicle. Furthermore, as the degree of efficiency improves, manoeuvrability inevitably gets worse. I understand that a modern 40,000-ton tanker proceeding at 20 knots takes about 4 miles to stop, and yet such a performance is accepted.

MR. J. T. FROUD (Senior Designer, English Electric Aviation Co.): Mr. Cockerell mentioned a type of Hovercraft with solid side-wall curtains immersed in the water, and I believe, having a water curtain at the front. Now, can that water curtain be replaced by an air curtain and the rear curtain by a solid shape, i.e., the hull resting on the water surface, so that we have now reduced the length of the curtain to a quarter of its original length? You would thereby probably save a lot of power? What are the problems of stability with this approach? Would the craft become unstable if it encountered waves of various wave lengths, speeds and heights?

THE LECTURER: If you make the back of your craft solid, in fact let it come down to the water surface, what you are really doing is running the craft at a rather high angle of incidence. You have at first sight saved a lot of power by such an arrangement.

However, the power you have saved on lifting jets has now got to be expended in the form of additional thrust to overcome the incidence drag and, at least to a first order, you are no better off from a power-saving point of view. As to the stability and practicability of such an arrangement, it depends upon the speed one is designing for. At 30 knots, such an arrangement could probably be made stable and strong enough to stand up to the impacts of waves. At 100 knots it would almost certainly fall to pieces, whether it was stable or not.

MR. FROUD: Would you think that the air cushion could be maintained, such that the solid wave curtain would lie on the wave surface and never actually be submerged, if the air cushion pressure was regulated sufficiently? Then the wave during its traverse under the hull would probably never hit the under-surface, the wave energy being reacted by the air cushion. What I am trying to say is, would the boat 'porpoise' as it goes along and break itself up or would the pitching moment (if any) be affected by the rear 'solid curtain' leaving the water surface, as soon as pitching starts, thus opening a gap at the rear, which, acting like a vent-valve, would release the air cushion, causing the rear end to fall back and so maintain the stability?

THE LECTURER: I do not think I can answer these questions in general terms. The Hovercraft, like anything else, has to be designed. In other words, one has to end up with a design that works. One cannot state here and now that such and such will or will not work.

Such arrangements have been considered and discarded as not offering anything of value. We may however have missed some attractive feature, or some special application.

MR. G. E. NORRIS: I wonder if Mr. Cockerell can give me some idea of the predicted relationship between the size of the craft and the height of hover? I noticed that the small model Hovercraft had a hover-height of half an inch and the S.R.N.1 was about thirteen inches. I am assuming that the larger the craft, the greater the height.

THE LECTURER: Hovercraft begin to look attractive on a power basis for hover-heights of less than about one-tenth craft diameter. At hover-heights of the order of a quarter of craft diameter it would be more efficient to use a helicopter rotor. This is not a hard and fast line but it is a guide. One must remember that there is a lot of further development potential to exploit in lifting systems and there are other ideas, such as flexible Hovercraft, which hold out the possibility of greatly extending the capability of the craft to surmount surface irregularities. What you see now is only the beginning of a fifty-year development programme.

MR. J. P. CAMPBELL (British Railways, S.R.): I was very interested in Mr. Cockerell's comparison with ships in respect of tonnage. I think he mentioned ships of 3,000 to 4,000 tons; is he referring to gross tonnage or displacement? On a cross-Channel ship of 3,500 gross registered tons, the loaded displacement (weight of ship in loaded condition) could be approximately 2,750 tons; included in this is a deadweight of approximately 650 tons, which figure is the difference between the light and loaded displacements and comprises the weight of fuel in bunkers, fresh water, ship's stores, crew, passengers and cargo carried. The actual pay-load carried, i.e. passengers and cargo, might amount to only 350 tons.

THE LECTURER: The differences in terminology between the shipping and aircraft worlds is a great hindrance to the bringing together of these two sciences, as they must be brought together, for the proper design and exploitation of the Hovercraft concept.

For marine craft a gross ton is 100 cubic feet, whereas the aircraft industry uses 'all-up-weight', which is nearer to your 'displacement'. The definition of payload seems to be the same in both industries. A Hovercraft with an all-up weight of 1,000 tons would have a gross tonnage of 3,000 to 5,000.

MR. STEPHEN HITCHINS: I am not clear about this thrust. I understand that normally

action and reaction are equal and opposite. Suppose the Hovercraft weighed one hundred tons, and you have got it in operation, could it safely be superimposed over a platform which would only take, say, 30 tons without that principle?

THE LECTURER: The weight of a Hovercraft is felt by the surface beneath it and in this regard it is exactly like any other surface vehicle, such as a motor car. So the answer to your question is that the platform would collapse.

A short while ago somebody stated that a Hovercraft is an aeroplane, but in fact the one thing a Hovercraft cannot do is take off in the sense that an aircraft can take off and become airborne. If a Hovercraft travelled over a pit, it would fall into it, whereas an aircraft, when airborne, would not be aware of, or affected by, the pit. A Hovercraft may be said to be air-cushion borne and at all times depends upon the surface beneath it for support.

Not an aircraft, not a ship. An aircraft travels in air and obtains support from air. A ship travels in water and is supported by water. A Hovercraft travels in air and is supported by land or water.

THE CHAIRMAN: I want to say, in answer to almost all of you, that as far as the Hovercraft is concerned, this is 1904, in the time scale of the aeroplane and the Wright Brothers. Last year we flew the Hovercraft for the first time, and it is a remarkable indication of our technical progress in the past fifty years that we can talk so confidently and so wisely about the potential of a vehicle which in effect was only demonstrated so recently. Now you will understand that it was impossible to put across to a general audience anything like the whole picture of Hovercraft in a short lecture, but the fact of the matter is that a number of us who have had close contact with the Hovercraft idea for several years are convinced that it has a real place in transport. It certainly is not a universal general purpose vehicle; it is not a sewing-machine or a bicycle, it is not any good as a wheelbarrow, it will not jump; but that does not prevent it being an extremely useful device, and as Mr. Cockerell took a lot of pains to explain this afternoon, it fills a gap in the transport system of the world which has been there since the beginning.

I think that most people here will go away thoughtful, and perhaps in a year or two's time will have the pleasure of saying either, 'Well, I told you so', or, 'I never did believe it'—depending, of course, on whether or not you have been convinced this afternoon. We hope, with the support of the National Research Development Corporation, to get useful prototypes built and used, and with them to explore the practical possibilities of this device and really put all these ideas to use as effectively as we can, in many places of the world which are at present ill served with conventional transport.

The Chairman then proposed a vote of thanks to the Lecturer, which was carried with acclamation.

MR. OSWALD P. MILNE (Chairman of Council of the Society): I am sure that as well as showing your appreciation to the lecturer you would not wish to leave this room without recording your thanks and appreciation to Mr. Shaw for presiding. He has kept you in order; and he most charmingly introduced the lecturer by telling us something of his romantic career and of his own collaboration with him. This is, as Mr. Shaw has said, indeed an historical afternoon for us, for we have learnt something about a completely new invention, something that is neither a ship nor an aeroplane. Mr. Shaw by presiding has added distinction to the afternoon because, although he is a great expert in everything to do with aircraft, he had the vision to see that there was something in this machine when it was brought to him. We thank him very much for presiding.

The vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

THE PROBLEMS AND PROSPECTS OF AIR TRANSPORT

A paper by

PETER G. MASEFIELD, M.A.,

*President, Royal Aeronautical Society, read to the Society
on Wednesday, 25th May, 1960, with Sir George Edwards,
C.B.E., Managing Director of Vickers-Armstrong (Aircraft)
Ltd., and a Vice-President of the Society, in the chair*

THE CHAIRMAN: I am not going to go through Mr. Masefield's long career in detail, but it is worth reminding you that in his earlier days he included in his activities work on the design staff of a company in the aircraft industry, and journalism in the aircraft technical Press and national Press. During the war he was associated with high level Government activities as personal adviser to Lord Beaverbrook, and Secretary of the War Cabinet Committee on post-war civil transport. He achieved fame as civil air attaché in the United States, and set a standard which every successor has found difficult to live up to. He served for a spell in the Ministry of Civil Aviation in those formative post-war years as Director-General of long-term planning, and then I think made probably his biggest contribution when in B.E.A. he played such a major part in setting that particular airline on a solid path of success and prosperity. As Managing Director of the Bristol Aircraft Company he returned again to the aircraft industry of his earlier years. He has delivered a number of most important papers as President of the Aeronautical Society, and has been Chairman of, or connected with, almost everybody associated with the activity of flying as flying. He travels round the country in his own light aeroplane, which he flies extremely competently, and he is an unflinching and unrelenting enthusiast about the position of light aeroplanes. So far as qualifications to talk about the problems and prospects of air transport are concerned, then, I think it is difficult to find anybody who has had the spread of experience that Mr. Masefield has had.

The following paper was then read.

THE PAPER

INTRODUCTION

Commercial air transport is, at once, the newest, the swiftest and the highest cost means of the carriage of passengers and goods over long and short distances. It knows no barriers of land or sea—but, in its forty-one years of development, international air transport has—unfortunately—become closely hedged around with man-made restrictions. Air transport has cut journey times over long distances to a fraction of their former values. The development of the transport aircraft is progressing faster to-day than at any time in the past. But the economic and commercial progress of the business appears often to be pursuing an ill-defined and wavering path. Indeed, in looking ahead at air transport's future

prospects, one is reminded of Don Marquis' remark that: 'Ours is a World where people don't know what they want and are willing to go through Hell to get it.'

However that may be, the air transport business has now been built up to a substantial size. During 1959—air transport's fortieth year—there were some 96 million individual passenger journeys on airlines of the Western World, and some 60,000 million passenger miles were flown—an average journey distance of a little more than 600 miles for each passenger. Passenger traffic accounted for some 78 per cent of the total revenue load ton miles operated, cargo and baggage for some 17 per cent, and mail for the remaining five per cent. Thus air transport is distinct from almost all other forms of transport in that passenger traffic and passenger revenue predominates. At sea 86 per cent of the revenue comes from cargo. Freight traffic on the railways accounts for 74 per cent of its income. Even on the roads goods loads account for 48 per cent of the revenue earned by public transport services, as well as for almost all the 'C' Licence traffic. But in the air the passenger is king.

Although passenger traffic represents the major preoccupation of the World's airlines, even in these times of 100 to 180-passenger jet aircraft cruising at up to 600 miles an hour, the average number of passengers carried in each aircraft is only 31 (at 58 per cent passenger load factor, in an average of 53 seats available in each aircraft), while the average cruising speed achieved on all the World's airlines in 1959 was 217 miles an hour.

In fact, out of 5,360 transport aircraft in service at the start of 1960, 4,560 (85 per cent) were powered with piston engines, 672 were propeller-turbine types, and 128 jets. Jets thus made up only 2.2 per cent of the total—and are likely to remain in the minority for many years to come, although the proportion of the World's total airlines carrying capacity which they represent will advance rapidly.

At the start of this year—1960—600 jet aircraft were on order—of which some 270 were due for delivery during 1960—while there were 850 unfulfilled orders for propeller-turbine aircraft. A striking fact is that the 400 jets scheduled to be in service by the end of 1960 will have the same productivity potential—in terms of ton-miles per annum—as 4,000 of the piston-engine types in service.

All this illustrates a further significant and fundamental feature of World air transport—its steady rate of traffic growth. Since 1929, air traffic throughout the World has increased at an almost steady rate of about 15 per cent per annum. Traffic has doubled, consistently, every seven years. Provided that the general economic expansion of the Western World continues, there is no sign that this average rate of increase in air traffic is likely to slacken off yet awhile—in spite of one or two small 'wobbles', such as in 1958, when the rate of increase fell to 5 per cent.

On the cost side, World air transport is working out at some 56 pence for each load ton-mile operated—or just over fivepence a passenger mile. By comparison with other forms of transport, on a capacity ton-mile basis, estimated figures work out as follows:

COST PER CAPACITY TON MILE

Air: 35.0 pence per C.T.M. at 217 miles an hour
Road: 4.0 pence per C.T.M. at 20 miles an hour.
Rail: 1.5 pence per C.T.M. at 20 miles an hour.
Sea: 0.15 pence per C.T.M. at 15 miles an hour.

Many variables, of course, influence these costs—size of vehicle, length of haul, load factors achieved, the passenger amenities provided, investment in track, terminals and vehicles. But these figures are enough to show that air transport is some 230 times more expensive to operate and some 15 times faster—on the average—than the largest transport service of all—the sea. In ratio of size—British sea transport achieves some 700,000 million load ton miles per annum (oil and grain being the largest items) while British air transport is now achieving some 450 million load ton miles per annum (76 per cent passengers). British sea transport thus carries some one thousand times more load than the air at only 0.4 per cent of the cost per capacity ton mile, but at only 7 per cent of air transport's average speed.

So much for the background. Air transport in 1960 is the high speed, high cost, high-rate-of-expansion business—with the World—and Outer Space—before it. The demand for air transport is such that the vast increase in capacity offered by the large jet airliners will become absorbed almost as soon as they are all in service. At the same time, the technical revolution of the new prime-mover—the gas-turbine engine—is throwing on the scrap heap airworthy, and otherwise economic, piston-engine aircraft which cannot attract adequate revenue loads in competition with the newer types.

AIRCRAFT DEVELOPMENT

Although air transport is essentially a system, in which many components have to be matched carefully to achieve an efficient and effective whole, a predominant feature in all its history has been the flying vehicle.

Over the years we have seen the biplane replaced by the monoplane, the airship eliminated from the race in favour of the fixed wing, multi-engined, pressurized, metal aeroplane. We have seen the turbine engine enter the field and the demands for take-off and landing distances increased from 500 yards to two miles. Passenger capacities have gone up from 8 to 180 passengers, speeds from 90 to 600 m.p.h., ranges from 200 to 4,000 miles.

In the next decade the technical advance of the vehicle will be no less significant. Predominant among the advances for which plans must not be made are the long-range supersonic transport and the large transport helicopter.

There seems no doubt, now, that the supersonic transport aeroplane—cruising at somewhere between 1,500 m.p.h. and 2,000 m.p.h.—will be a reality before the 1960s are over, and that it will be a major factor from the decade of the 1970s onwards. There seems, equally, little doubt that—for long-range operations—the supersonic transport will be an economic proposition at fares

comparable to those which prevail to-day. For short and medium ranges the supersonic transport is much less attractive on grounds of cost and noise.

Short-range inter-city services are, however, best suited to the development of the large helicopter. A major advantage of this form of vehicle is its ability to cut out the slow and frustrating journey from city-centre to airport by flying directly from city-centre to city-centre. The large helicopter of the next decade seems likely to turn out to be reasonably economic only for distances of between about 100 and 250 miles. But before it can be used satisfactorily the noise problem has to be overcome. In this direction the type of transmission which depends upon a form of jet propulsion from the tips of the rotor-blades—such as is used on the 'Rotodyne'—is much less easy to make tolerable than the 'twiddle-in-the-middle' form of transmission from turbine engines driving rotors through shafts. Now that all British helicopter development is centred under one company's control, concentration on the most tolerable solution may, in due course, be easier to achieve.

If the supersonic transport, eventually, predominates in the long-haul transport area, and the turbine-powered helicopter operates in the short-haul field, the medium range operations—from 250 to 1,500 miles—are left less adequately served.

TRAFFIC FLOWS

In this direction, the classic transport traffic incidence is of importance. Because of the costs of travel and because of communities of interest, by far the bulk of the World's transport movement is over short distances. A study made recently in the United States showed that:

- 57 per cent of all passengers travelled for journeys of less than 50 miles.
- 18 per cent of all passengers travelled for journeys of between 50 and 100 miles.
- 15 per cent of all passengers travelled for journeys of between 100 and 250 miles
(this is the helicopter field).
- 6 per cent of all passengers travelled for journeys of between 250 and 500 miles.
- 2.5 per cent of all passengers travelled for journeys of between 500 and 1,000 miles.
- 1 per cent of all passengers travelled for journeys of between 1,000 and 1,500 miles.
- 0.5 per cent of all passengers travelled for journeys of more than 1,500 miles.

An added fact is that, within the United States in 1959, for journeys of less than 200 miles, only 10 per cent of passengers travelled by air, and that for journeys of more than 1,500 miles 80 per cent of the total number of passengers travelled by air. These ratios would not, however, apply yet to Europe, where the equivalent annual air mileage flown by each inhabitant was four—compared with 104 miles per inhabitant per annum in the U.S.A.

This tabulation shows, however, that in the U.S.A., the area of the helicopter's major impact—journeys of between 100 and 250 miles—has an annual travelling population of 79 million persons—compared with only seven million who travelled on journeys of more than 1,000 miles. There is a vast, untapped, air potential in the short-haul helicopter field—provided the costs can be made reasonable. This is, as yet, some way off, because of the uneconomic basic nature of the helicopter system.

In the area of journeys of between 250 miles and 1,500 miles—the medium-haul fixed-wing field—54 million passengers (10 per cent of the total travellers by all forms of transport) moved in the U.S.A. in 1959. That is some 15 times the total traffic which crossed the Atlantic by sea and air in the same year.

These medium-haul sector distances over which the helicopter is not suitable and the supersonic transport potentially very expensive, represent some of the most lucrative future fields for air transport and the best field for the future exploitation of the economic subsonic jet—probably, in the next decade, powered with ducted-fan low-consumption engines.

We are likely to see, therefore, a substantial development of medium-range subsonic transport aeroplanes which will cater for the largest air passenger movements of all—while the supersonic transport caters for the lesser demands of long-distance air transport, and the helicopter for the short haul field in which its competition with surface transport will be limited by its high cost.

THE FARE STRUCTURES

In World air transport affairs the two British airlines—B.E.A. and B.O.A.C.—have led the field in the battle for lower fares, spurred on by pressure from a number of British independent airlines. As a result so-called ‘coach’ and ‘third class’ fares on British cabotage routes are in some instances running at 30 per cent less than present tourist rates with special emphasis also on ‘off peak’, mid-week and late night fares. Some of these reductions are made possible by reduced baggage allowances, no free meals and still tighter seating arrangements.

On the North Atlantic in 1959, 74 per cent of all Atlantic passengers flew at ‘economy’ fares and only 21 per cent took first class tickets. The million passengers who flew ‘economy’ class offered the airlines load factors of around 68 per cent, whereas the first class load factors were only 64 per cent over the Atlantic.

In the United States the same trends were in evidence. Coach traffic went up 22 per cent during 1959 and accounted for some 44 per cent of all travel. There is increasing evidence that differential fares will become a developing part of air transport problems in the future.

Nor, in this consideration, can the problem of the seasonal traffic peaks be ignored. B.E.A.’s Channel Islands routes are, perhaps, the extreme example—where the bulk of the years’ traffic is carried in three summer months with high ‘peaks-within-peaks’ on summer Saturdays at popular times of day. Such features represent a major economic problem in aircraft and staff deployment and tend to raise the whole cost structure substantially above its, otherwise, natural level.

Such then is the background to the problem of organization in air transport throughout the World—and in individual countries. Since the War, the pattern of national and international air transport has settled down into operations by a number of major ‘flag carriers’ designated by their respective governments to exercise traffic rights negotiated by means of bilateral agreements.

THE LARGEST OPERATOR

The United States is by far the largest operator of air transport services.

Indeed, in terms of passengers carried, the United States accounts for 65 per cent of the Western World's total. And the ten major United States airlines—'The Big Five'—American, T.W.A., United, Eastern, Pan American, and 'The Middle Five'—Northwest, Delta, Capital, National and Braniff—between them account for nearly 50 per cent of the World's total.

Next in size of traffic handled comes Brazil, with some 5 per cent of the Western World's air passengers. The United Kingdom is third with 4 per cent followed by Canada, France and Australia. In the international field, excluding the United States domestic air services, which account for 59 per cent of all passengers carried, the ten World's major airlines in order of revenue ton miles operated are:

1. Eastern Air Lines (U.S.A.)
2. American Airlines (U.S.A.)
3. Trans-World Airlines (U.S.A.)
4. United Air Lines (U.S.A.)
5. Pan-American World Airways (U.S.A.)
6. Air France (France)
7. British Overseas Airways Corporation (U.K.)
8. K.L.M. Royal Dutch Airlines (Netherlands)
9. T.C.A. (Canada)
10. Delta (U.S.A.)

The significant feature here is that, although United States airlines bulk so large in this list, the United States carriers' proportion of air traffic between the U.S.A. and foreign countries is steadily declining. In 1950 United States carriers accounted for 85 per cent of all international air traffic into and out of the U.S.A. In 1959 this percentage was down to 57 per cent—although 64 per cent of the passengers were American citizens.

A feature of air transport, however, is the fact that even the smaller nations consider that their national prestige must be served by the operation of an international airline, often across the major oceans of the World into the bigger traffic centres such as London, New York, Paris and Rome. A natural—and uneconomic—corollary of this is the tendency to negotiate restrictive traffic agreements so that traffic is more or less forced to fly in equal proportions by the national carrier and its foreign reciprocal, regardless of the respective efficiencies, records and attractions of the different airlines.

These restrictive practices—usually by limitation of frequencies and by the denial of the so-called 'Fifth Freedom' rights to airlines of third countries—seem to be on the increase rather than the reverse. Such a policy results in the pernicious doctrine of the 'roped off seat'. The problem is certain to get more acute when the era of the supersonic transport arrives. Small nations will not be able to afford aircraft costing, perhaps, £4 million each. If recent history is a guide, they may attempt to ban competitive supersonic services, except at very high premium fares, or they may insist that such services are restricted to a small proportion

of the traffic demands. In either case the best interests of the travelling public are not being served.

No immediate answer to this problem of national restrictions appears to be in sight. In due course nations—as well as individuals—will, no doubt, come to see that improved transport is a good thing, and the more of it the better, regardless of its origin. Even so, reasonable safeguards to prevent ‘cut-throat’ competition and to match capacity broadly to the traffic requirements of a complete route network, as well as between any two points, must be maintained. Eventually a multilateral agreement, such as was attempted at Chicago in 1944, will be the only satisfactory solution.

DOMESTIC PROBLEMS

If international air transport politics present a problem, some of the domestic issues are no less acute. In the United Kingdom, for example, the issue of how to provide a satisfactory arrangement under which the State Corporations and the independent airlines can live happily together remains unresolved. On this subject successive governments have known the precise psychological moment when to say nothing—and have continued to say it. The fact is that the State Corporations—B.E.A. and B.O.A.C.—were set up to perform a particular job of carrying air traffic over designated routes at a profit and any undermining of their opportunities to perform their job is liable to be looked upon as a betrayal of a trust—especially when the profitable state is so difficult to achieve and to maintain.

The steadily increasing expansion of air traffic, however, and the emergence of a number of specialist air transport activities—such as the Cross-Channel Car Ferry—is opening up opportunities for new developments which will broaden the base of British air transport without that ‘substantial diversion of traffic’—or the ‘skimming of the cream off the lucrative routes’—which is the concern of the Corporations.

Quite obviously, the device of making independent companies ‘associates’ of the Corporations has not worked and could do no more than patch up an unsatisfactory situation. The projected ‘Air Transport Licensing Board’, with the means of making a full and impartial assessment of the economic and the public interest aspects of route allocations and competitive aspects, may well turn out to be a means of working out a practical solution which has so far eluded British air transport politics. We may hope for better things.

SAFETY

Any discussion of air transport to-day would be incomplete without reference to safety. New jet transport aircraft, which carry up to 180 passengers and require 12,000 ft. runways on which to accelerate to around 150 knots, represent a potential hazard greater than any which has existed so far. One cannot dodge these facts. Nevertheless, the first year of major jet operations has, fortunately, been completed without serious accident and there is no doubt at all that much more practical means of achieving air safety are being employed to-day than ever before. In fact, air transport to-day is operating at a rate of safety of less than one passenger fatality for each 100 million passenger miles flown. This is

some three times safer than travelling on the roads in a motor car. And, while the road safety statistics are getting worse, those for air transport are improving.

One thing is quite certain. The development of fully automatic take-off and landing apparatus, for use on all occasions in all aircraft, now moving from the experimental to the commercial stage, will advance air safety—and economy—substantially within the next ten years.

CONCLUSION

Air transport throughout the World is thus expanding fast, and the rate appears likely to be maintained. At the same time technology is advancing even more rapidly than in the past and we are likely to see the long-range supersonic transport aeroplane and the short-range transport helicopter in service on a substantial scale within the next decade.

Air transport is not, however, showing the profitable results for which its advocates have hoped for so long. Many airlines are still losing money and the average 'profit margin' is around a mere 3 per cent, which is a poor return on the very large sums invested. Indeed, during the first two months of 1960, the United States domestic trunk airlines lost a combined total of \$9 million. The fact is that the jets—now carrying some 40 per cent of United States domestic trunkline traffic—have the capability of making substantial profits at high load factors, or heavy losses should load factors fall—as in winter. In the new jet age, when profits and losses are balanced on a knife edge, some airlines will face a battle for survival. More mergers in airlines, as well as in manufacturers, seem certain.

The chief reason for recent poor economic results is that the rate of re-equipment for 'the jet age' has been outstripping the financial resources available. Although the jet aircraft have made possible an important reduction in journey times over longer ranges, air transport as a whole would be in a much more healthy situation, economically, had 'the jet age' been postponed for five years or so.

The lesson may be learned for the decade ahead. Existing jet aircraft will be written down to relatively low 'book values' before 1970 when the next major step in re-equipment can be expected. On medium range services, developments of present aircraft will probably provide the most satisfactory answer. Thus an improving situation can be looked for in the years ahead.

Such revolutionary new vehicles as the Hovercraft or V.T.O.L. jet, will not, in my view, be likely to play any significant part in commercial air transport during the 1960s. The Hovercraft is, in reality, a displacement vehicle—like a ship or a motor car—rather than a lifting aircraft. It uses the air as a cushion to reduce friction, but in all other respects can be considered a means of surface transport. And, in the development stage, at least, it will remain slower than modern aircraft and more expensive to operate than other surface craft.

The V.T.O.L. jet will not be likely to come into service for commercial air transport during the next decade because of its high operating cost and high noise level. Later on—perhaps during the 1970s—new developments of both these

basic principles may offer advantages at present out of sight. At the same time, the possibilities of rocket propulsion and ballistic trajectories applied to long-range freight—and, later, passenger—transport, is now among the possibilities.

The problem remains for the human arrangements to keep pace with the technical advances—arrangements so that socially, commercially and economically the most can be extracted from a form of transport which overcomes all those geographical limitations which still circumscribe surface movement. Air transport—and indeed aviation in general—attracts in men a devotion and an enthusiasm such as is equalled only in those who live for their horses and those who live for their gardens. Indeed, there is a certain fanaticism about aviation which has, in large degree, led to some of the major advances of the past generation. It is said that 'Fanaticism consists in redoubling your effort when you have forgotten your aim'. Our future need in aeronautics is to be sure of our aim—the future welfare of humanity—and redouble our effort to serve it.

One thing should never be forgotten about commercial air transport—and, indeed, about commercial transport of any kind. That is that the purpose of transport is to serve the community in the widest sense—that public interest transcends private interest, that public accountability has to be married to individual enterprise and that 'full information' is the best guarantee of sound intentions.

Commercial aviation—above all other means of transport—has immense prospects for the future. Its wise public regulation and its imaginative private development must be related in full proportion to gain the results which all the World hopes from it.

DISCUSSION

MR. A. POWIS BALE: This excellent lecture has dealt chiefly with the economics of air transport. I feel that I should like to know a little bit more of the things that are not in the air; runways, for example, and maintenance costs, which can be extraordinarily diverse, even between such companies as B.E.A. and B.O.A.C. My particular interest is in a note I saw in the *Daily Telegraph* to-day, dealing with this new body-type wing construction, in which you eject compressed air into the wings, which alters the aerodynamic shape of the wings by ejecting air or exhaust gas through slots. They claim 40 per cent reduction in the length of take-off run on the runway. I am only an ordinary mechanical engineer, but I cannot see it being done. I should like to hear the opinion of our lecturer.

There seems to be quite a future in the vertical take-off slow-speed machine. I saw some figures for vertical take-off machines at slow speed, and not rising very high in the air at all seems to meet a certain problem in air transport. That slow-speed vertical take-off should be quite valuable.

THE LECTURER: Perhaps some aspects of those matters could best be answered by the Chairman. But a word on the first point—'bleeding' the air from the wing to reduce take-off run or to reduce the drag of the wing. Now it is an infallible law in air transport, in aviation, in aerodynamics—and in most other things too—that you can't 'get something for nothing'. And you certainly don't get something for nothing just by sucking some air. The jet flap is a major step forward in reducing landing speeds, particularly for aircraft flying from aircraft carriers. But it has its complexities, both in manufacture and in maintenance.

If money has been spent already on a runway, then the efficient and economic thing to do is to build an aeroplane which will lift the maximum load off that runway, making use of the concrete that somebody else has laid down at home or overseas. So we shall probably reach the stage that if you can improve the lift of the wing by means of suction or by blowing a jet over a flap (which you certainly can do), then the right way to use those things is still to use your runway but to improve your payload, which I think I showed was the economic way of getting costs down. This is probably the way it will be used, because the runways are there. If the vested interest was not already in the runway then probably the pattern would be quite different. But the fact is that long runways have been built at great expense all over the world and the right way now, economically, is to get the biggest payloads off them, consistent with safety.

But for the war I think we should have seen the flying-boat progressing to-day. The war killed the flying-boat because it caused vast numbers of runways to be laid down. And once they are down you might as well use them. Unfortunately water runways are not at all cheap, because they must be surrounded by maintenance facilities, radio aids, and all the rest. It is the more regrettable, because the flying boat combined yachting and flying in delightful proportions, and was a very pleasant way of going about.

You ask also about S.T.O.L. (short take-off and landing), and V.T.O.L. (vertical take-off and landing) aeroplanes. From the military point of view I think both have great application because the requirement is to get in and out of short strips regardless of cost and regardless of noise. You cannot afford to ignore those two things in air transport. If you put your money into short take-off—big wings, or big flaps, or flap-blowing or something of that sort—it is going to cost a lot of money and therefore, except for a particular bush type of flying it is not going to be worth doing. The 'Hovercraft', of course, is something quite different and I am not sure whether you had that in the back of your mind when you put your question. But the 'Hovercraft' is not an aeroplane. It is a form of surface transport, a displacement vehicle, not an airborne vehicle. As such, perhaps the 'Hovercraft', in due course, may have a considerable position in transport. But let us be quite sure that it is not an aeroplane, but a different means of surface transport which at the moment is very much slower than an aeroplane and very much more expensive than any other form of surface transport. These are very early days, and I am not being damning. I am just saying there is a lot of development still to be done.

CAPTAIN J. L. PRITCHARD: It is unfortunate that the engineering progress of international air transport should be devilled by national prestige demands for bigger, faster, more pretentious aeroplanes. The result leads to too big a jump in speed and size, bringing difficulties which have not been revealed by the extrapolations from the curves of earlier design.

With supersonic air transports cruising at 1,500–2,000 m.p.h., the time saved on route (the Atlantic, for example), may be lost by that taken to load and unload the passengers and their luggage. Structurally it will be difficult to provide the necessary entrances and exits for a number of passengers exceeding say, 200, without a weight penalty and corresponding increase in operating costs. Does Mr. Masfield visualize a limit on the number of passengers on a given plane on this score?

Aerodynamically there is much research, considerable full scale flying, and a wide variety of conclusions about supersonic flight. Full-scale flying is mainly military, and it remains to be seen how far that kind of experience can be of use in the design of civil aircraft.

In 1958 G. H. Lee of Messrs. Handley Page declared that increases of speed above 2.25 Mach number were unlikely, on the score of operating costs and kinetic heating, and suggested that 'direct operating costs of a 1,500 m.p.h. supersonic airliner need only be about 25 per cent above those for a long range jet transport'.

In the following year, H. L. Hibbard, in his Plesman lecture, declared, 'Despite lack of definitive information at the higher speeds, I predict that clearly attractive payload at speeds of Mach 5 or above, resulting in practical and economical operation'.

In 1960 Mr. Masfield suggests that the supersonic transport cruising at 1,500-2,000 m.p.h., in the decade 1970 onwards, will be economic at fares comparable with present-day fares.

Now only one-half of one per cent of those who fly as passengers do so along those long-range routes which justify supersonic speeds. One can only conclude that their ideas of economy vary from that of the majority of air passengers who fly 50 miles or less.

Mr. Masfield very rightly pays attention to the importance of speed, but I sometimes wonder if he, and many of those who have done so much to advance commercial flying in all its forms, have not had qualms that aviation itself has moved too fast since the end of the Second World War. Perhaps H. L. Hibbard was right when he said in his lecture, 'This leads me to conclude that the world's commercial air carriers will have aircraft capable of cruising at Mach 6.0 to 7.0 in the foreseeable future, and by foreseeable future I mean 30 to 40 years from now.'

Round about 5,000 m.p.h. in A.D. 2000?

THE LECTURER: Thank you, Captain Pritchard. You are always controversial! You remind me of those words of C. G. Gray, 'The great thing in aviation is to simplicate and add more lightness'—a quality which we try to pursue and always find elusive. I agree with you that one of the great problems of large aircraft is getting passengers in and out quickly. I think that multiple exits and entrances are one of the answers to this. In fact, nowadays the modern large jet aeroplane is normally being loaded through at least two doors at once and we shall probably have to go to more. There is no doubt that size is going to bring its own problems with it. But frequency of service, combined with the high speed of the possible supersonic transport of the future, might mean that such an aeroplane could well be smaller than some of those large jets with which we are now becoming familiar.

Boundary-layer suction, to improve the aerodynamics of an aeroplane, is certainly likely to be attractive, economically, for really long-range machines. But over shorter distances it doesn't show the same advantages. My belief is that future supersonic transport aeroplanes are likely to approach to-day's operating costs per seat mile or per ton mile for long ranges but not for short. At the same time we ought to see much lower operating costs achieved with improved sub-sonic aircraft.

Over the shorter distances I believe that, gradually, a lot of people will find that they want to go to a lot more points than they are able to achieve on the scheduled air services, and that they will find—from a business point of view at least—that there are advantages in flying yourself once the right sort of aeroplane is available alongside the airlines but not in any way competing with them; in fact, indeed feeding into them. In the future we shall probably see a great growth of executive and business flying just as we have seen the growth on the roads of the individual motorist.

MRS. ALISON MUNRO (Under-Secretary, Ministry of Aviation): The speaker mentioned that one of the principles that we should follow in future was, fly British. I do not want to sound unpatriotic, but with the present high cost of introducing new equipment surely we are coming more and more to realize that we cannot 'go it alone' in aviation, and that we have got to depend more and more on partnerships with others and on international co-operation?

THE LECTURER: I should entirely agree with Mrs. Munro, who has so much experience in these things, that international co-operation has to become more and more the watchword. And I am of the school who believe that the supersonic transport may well best be achieved by collaboration with the Americans. There are advantages

to both sides there. We have some things to offer to the Americans, technically and in costs of construction. We ought to be able to persuade the U.S.A. that collaboration, from their point of view, is a worth-while policy. The same thing applies in the opposite direction in a number of other ways. Generally, international collaboration is an important part of air transport and particularly of course in the international traffic agreements which really are the foundation of the business.

One of the things which I just touched upon in my paper is the extremely difficult issue with which we are so often confronted; that every small nation to-day feels that it must have a major air transport operation of its own. It is not so on the seas and I think in the long run it cannot be so in the air. Inevitably there will have to be some 'air unions', as is happening in Europe. I feel quite convinced that in the future the small nations will not be able to run their own individual national air lines as in the past, and that international collaboration in this field is one of the most important goals that we have to pursue in the Western world.

MR. LUCIAN FOLDES (London School of Economics): We are always being presented with figures which show that large jets and other modern aircraft are to run at ever lower and lower cost, yet all over the world we see that it is the airlines that run these large modern aircraft that require protection from people who fly old broken down things which 'ought not to be in the air at all'. There are two possible explanations: one is that it is not true, the other is that the people who run modern aircraft are overcharging. I assume the reason is the second one, that they are overcharging and therefore they require protection, and they are doing this because they have other routes to pay for which require the transfer of this money. Is it Mr. Masfield's view that traffic would grow very much faster if some of the restrictions on flying, domestic and international, were removed, and that in the long run this would be beneficial?

THE LECTURER: Yes, I think we have grown into too restrictive a field in air transport. But it is a matter which needs very careful working out if the last result is not to be worse than the first. Restrictive practices have grown up internationally between governments, and also inside individual national arrangements. I hope that, in this country, the new Air Transport Licensing Board will be given the right 'teeth' and will go some way towards resolving this extraordinarily difficult problem of relating the task of the Corporations in operating British flag services to that of the independent airlines, who undoubtedly also have a part to play. It is certainly not true, however, that just because people are operating larger and more modern aeroplanes their costs are higher than those of people operating written-off obsolescent aeroplanes. Generally the trend is 'a benevolent spiral' instead of 'a vicious circle'. I believe that passionately.

The economic advance brought about by improved technology is quite clear in air transport. Many of the older types of aircraft are basically less economic to fly, for two reasons: first because they are less efficient aeroplanes, and secondly because they are very much slower and therefore cannot put the same number of ton miles, or passenger miles, into the hour—which is really the revenue-earning part of commercial transport. Against that you have the fact that some of the large new aircraft are terribly expensive to buy, and you have got to write them off over a relatively short period; not the thirty years of a ship. Therefore their standing charges are very high and the costs of their obsolescence, insurance and so forth are high. That is where the older aeroplane can gain. The real point, however, is whether the fare structure can be related to the type of aeroplane (as I believe could be worked out in practice), and not just to the route on which you are flying. In the future I think we have got to have a differential fare related to the type of aeroplane, and this in fact is being explored. But it will have to be handled very carefully if we are to avoid restricting development by restrictive fares.

A further complication is that some of those operating older aeroplanes wish only 'to skim the cream' off the business in the peak travel periods—and not to provide a service in the leaner travel months. A wise regulatory body has a vitally important function to perform in the public interest by ensuring opportunities for enterprise and avoiding the undermining of essential, all the year round, services.

MR. GILBERT J. PONSONBY (London School of Economics): We have often heard from Mr. Masfield's papers, and elsewhere, of the great economies that result from the use of large technical units (in this case the aeroplane), and also of the great economies of a high load factor. I should also very much like to hear from Mr. Masfield what precisely are the economies of a *high utilization* of capital and manpower. In many branches of transport, it is costly to provide a fast service. But there is always some compensating economy of quick turnover both of capital and manpower. This is very important in road operation. I should like to know what are the nature and importance of those particular economies, and to what extent they do compensate for the very high capital costs of getting speed?

THE LECTURER: There is no doubt at all that high utilization is one of the vital economic factors in air transport. You have just got to keep modern expensive aeroplanes in the air every moment that they can earn revenue, if they are to pay their way. Figures of ten hours a day are pretty moderate in air transport now; we have got to aim higher than that, to fourteen or more hours of revenue flying a day. But a difficult aspect of this is that the faster the aeroplane the more difficult it is to achieve a high utilization, as a generality. As an illustration, there are problems of arriving or departing at communally or socially obnoxious hours. When the supersonic transport arrives we shall probably find that we are limited in the utilization we can achieve, because it is quite impossible to arrive at an airport after, say, 2 a.m. in the morning—passengers (and nearby residents) will not tolerate it—or leave before, say, 6 a.m. in the morning. So there are those blank hours, which with the old type of aeroplane you could use up in flying across the Atlantic, with people sleeping peacefully. In the newer types this is not going to be possible, because the aircraft will be across the ocean before anybody has had time to shut his eyes. So high utilization, though tremendously desirable, becomes more difficult to achieve the faster you go, particularly on 'one shot services', such as New York—London. It is a little easier on longer routes, such as London to Australia, for instance. The fact remains that the more expensive the aeroplane (and we must expect aeroplanes to be costing four million pounds each before very long), the more important it is to get the maximum of revenue hours into the year—always provided, of course, that a reasonable load of paying passengers, or freight, can be achieved.

THE CHAIRMAN: I was interested to hear the discussion concentrate on the economic aspect of this business; whether one therefore assumes that the technical side of building supersonic aeroplanes is so well understood that nobody needs to talk about it any more, I am not certain.

Mr. Masfield deflected in my direction one of the early questions, on the subject of whether you want to go up out of Trafalgar Square in a pillar of fire, or whether you want to make use of the runways that benevolent governments and institutions have already provided. The arithmetic is fairly simple. By using the maximum amount of runway you can do about twice as well economically as you can if you use no runway at all. I think those of us who are involved in thoughts of supersonic transport believe that it is going to be difficult enough making it work from runways, without complicating things by making the take-off straight up. It is interesting to note that the most vigorous advocates of vertical take-off for supersonic transport are in the main those who are not likely to be involved in making it work. So I should agree entirely that the right thing to do with high lift devices and short take off devices as far as the commercial field is concerned is to exploit them to the full, because it is a

sad fact that no aircraft gets any medals for only using half the runway if somebody else is using all of it. These are the facts of life. The runways are there, and great capital facilities are there, airport buildings and customs buildings, hangars and all the rest of it are where the runways are, and I have never really seen how it is going to be possible to put all those facilities into city centres.

Well, we thank you very much, Mr. Masfield, for a paper which obviously has taken a great deal of preparation. It was a typical Masfield operation and we shall all be turning it up in print eventually, and using it on numerous occasions to prove a point. I am sure that everyone here will want to join me in expressing our very deep thanks to the lecturer.

The vote of thanks to the Lecturer was carried with acclamation, and the meeting then ended.

THE PATHANS

The Sir George Birdwood Memorial Lecture by

SIR OLAF CAROE, K.C.S.I., K.C.I.E.,

*delivered to the Commonwealth Section of the Society on
Tuesday, 17th May, 1960, with His Excellency Lieutenant-
General Mohammed Yousuf, High Commissioner for
Pakistan, in the chair*

THE CHAIRMAN: I am sure all who are present in this room either know Sir Olaf or have heard of him. We in Pakistan are very proud of the book he has written about the Pathans, and we are also very proud of the great service he has done in that part of the Indian sub-continent which is now known as Pakistan. He is one of those Englishmen who took a truly deep interest in the countries to which they were sent, and who looked on their task of service to the people of those countries as a mission. They were missionaries. Such men have a very great reputation for the good work they have always done and are still doing, which in Pakistan is greatly appreciated.

This afternoon Sir Olaf is going to tell us about those alleged-to-be-wild people who live in the hills round Peshawar and about some of the luckier ones in the well-watered Vale of Peshawar. A few in the audience have probably hunted or shot in that part of the world, and I suppose worked a little too! Being a Pathan myself, I am naturally looking forward to hearing Sir Olaf.

The following lecture, which was illustrated with lantern slides, was then delivered.

THE LECTURE

It is my purpose to-day, speaking to this Society, to dwell mainly on the art and literature of a people hitherto only recognized by the outer world for their prowess as men-at-arms. The Afghans and Pathans stand at one of the gateways of history, on a breakwater swept by waves of conquest yet always rising from the storm. In the Pathan name is a record of brilliant achievement far from their own land, even to the rank of Empire at Delhi. There is the Kingdom of Afghanistan. There are the memories of five generations of men from our country, from Mountstuart Elphinstone to Mountbatten. We have grown familiar with the Pathan; his virile, forthright qualities have become a commonplace. But he has lacked a recorder.

Pathans or Afghans? Which is it and what is the difference? From the sketch-map (Figure 1) you will see that the Afghans and Pathans dwell in a territory intersected by an international frontier, the Durand Line, drawn in 1893. In Afghanistan they occupy a far larger area, but in Pakistan they are much thicker on the ground. Before 1747, when the great Ahmad Shah Abdali founded it, there was no such country as Afghanistan; the territories inhabited by people of Afghan stock were divided between the Persian and the Mughal Empires. The results of this political division, which endured for more than two centuries, was that the Western Afghans of whom Ahmad's tribe, the Abdalis—called Durrani from this time—were the leaders, developed with a Persian bias and became Persianized

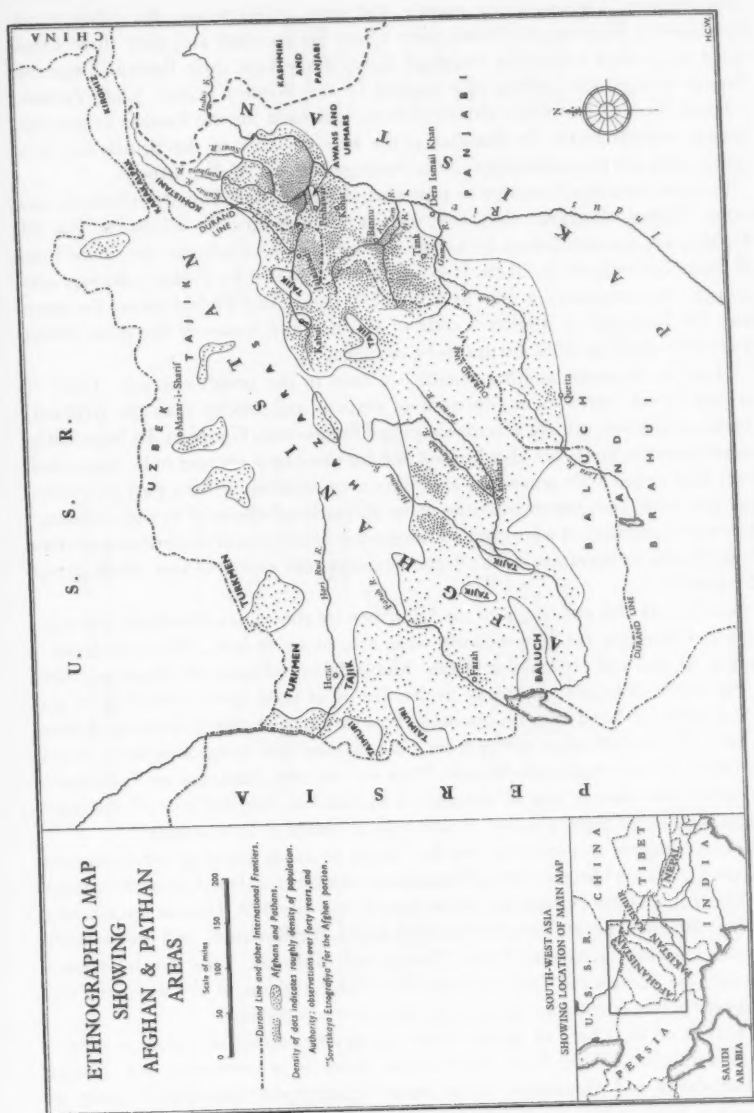


FIGURE 1

even to their language. Even to-day Persian is preferred to Pashtu in Kabul. The Eastern Afghans—now mainly Pakistani subjects—on the other hand developed a bias towards Delhi, over which (as we shall see) they three times ruled as Sultans before the Mughals came. They kept their Pashtu. Thus the Persian designation *Afghan* was applied to the Western tribes, while *Pathan*, a Hindi form of the native name Pakhtun, was used for the Eastern tribes who looked towards India. So Pakistan is the heir not only to the British but to a much older Mughal association in its dealings with its Afghan tribes.

It would be a good analogy to state that all Pathans are equally entitled to the name *Afghan*, wherever they live, just as Highlanders are all Scots. But all Afghans are not entitled to be known as *Pakhtana* or *Pashtana*, any more than all Scots can claim to be Gaels. It is only those who live by Pashtu who may aim so high; it is necessary to live by a highland code. And Pashtu means far more than the language; it implies a code of chivalry and a way of life from which those who dwell in cities are apt to be estranged.

There is, however, another distinction deep in the people's minds. There is no race in the world more conscious of descent and affinity than the Afghans. On the screen you will see a much simplified family-tree (Figure 2). Its beginnings are shrouded in myth, for Qais himself and his three sons are said to be descended from Saul in the 37th generation and their very existence is only part of a fable. But the table does reflect what the tribes themselves believe to be their relationship one to another; it sorts out and categorizes affinities and disparities traceable to-day in the appearance, habit, dress, language and so on, of this whole group of societies.

Note that in this genealogy all the hill tribes are shown as of doubtful ancestry. This is surprising for they include what are, to us at least, the most famous names, Afridis and Orakzais of Tirah, Mahsuds and Wazirs, the finest guerillas in the world, Khataks, so steady under fire or at their leisure whirling in the dance, sword in hand beneath the stars. It is certain that this tradition enshrines a truth that the hill tribes spring from a much older and indigenous stock, never disturbed in their mountain homes. They are the true Pakhtuns or Pashtuns—the difference here is one of dialect—as opposed to the Afghans of the open plains, descended from a mixed Turco-Iranian strain of later invaders.

Let us complete this initial survey by looking at a map showing tribal locations (Figure 3), and see how the various branches are distributed. It will be observed that the heartlands of the Pathans are in the central area of which Thal on the Kurram River is the nodal point. These are the hill tribes, the Karlanris, and they include Afridis, Orakzais, Khataks, Turis, Wazirs and Mahsuds. They are interposed between the Persianized Durrans and the Ghalji Afghans to the west, and the Peshawar tribes, Yusufzais, Mohmands and so on, to the east.

There is no time here to speak on the impalpable subject of distant origins—the rival theories, of the Bani Israel or the traces of a prototype, the Πάκτυς in Herodotus and Hecataeus—a far more exciting and established theory to my mind. Those who are interested could raise it in discussion. Our target now must be the civilization of this people since they emerged from obscurity into

GENEALOGY OF AFGHANS AND PATHANS
(Affinity by descent, not according to citizenship)

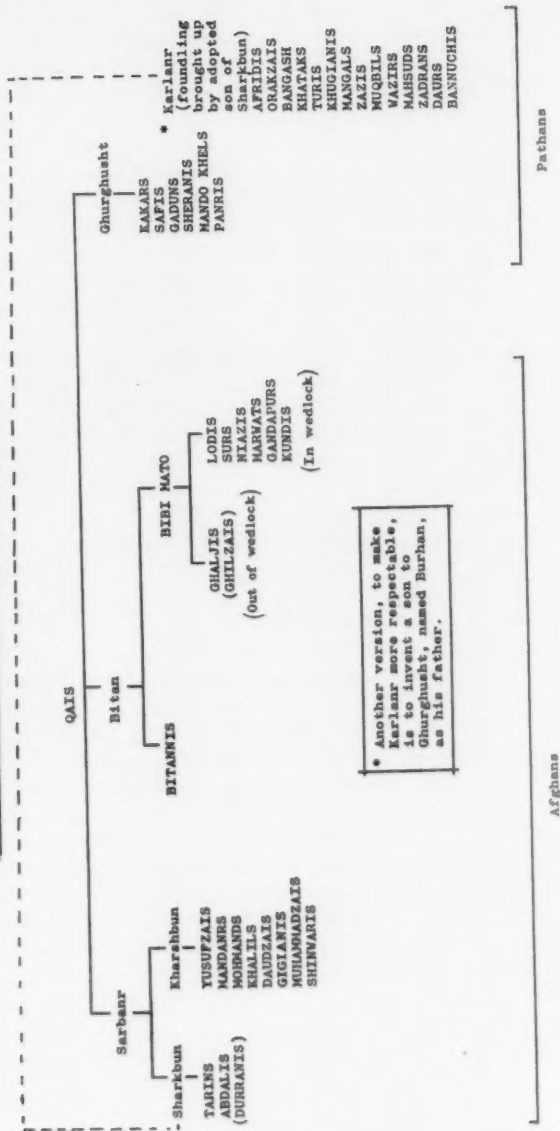


FIGURE 2

history with the armies of Mahmud of Ghazni early in the eleventh century. In that age the man we know was completed by his conversion to Islam.

What sort of man was he, and is he? Formed of many ingredients, an Iranian base overlaid by Graeco-Bactrian, Saka, and White Hun—and according to Procopius, a contemporary, the White Huns were fine-looking men with white skins and regular features, ancestors of whom any Pathan could be proud—it may be said that there is probably no people in the world with a higher average standard of good looks. In youth he is lithe and lissom, his features are clean cut, his complexion fair, he walks proudly and looks you straight in the eye; in age he has immense dignity. Always he has charm and poise. He is fearless to a fault. He is a good friend and a bad enemy. He is frequently obstinate, boastful and much too set in his ways. He never forgets a wrong, but it is as true to say that he always remembers a kindness. Always he is hospitable. He lives against a scenic background of great splendour and he caresses the delicate petals of flowers, of which, unlike most in Asia, he knows the names. He loves to tuck flowers in his headdress or behind the ear. His shrines are set in lovely secluded spots by wells or running streams, and he delights in mountain, forest and river. He is a great hunter and longs for the autumntide when the game returns. There are two Pashtu verses, which express well a Pathan's love of Nature, of which the translation might run:

I hold a posy in my hand here;
Let who'd enjoy the flowers' fragrance come then to me.*

And

The grace of God is upon the high mountain;
Upon his head a mantle of snow
And at his foot a flower-carpet.

What of the Pashtu language? The Prophet is said to have described it as the language of hell, even as Arabic was that of heaven, but even Prophets may be prejudiced. It has also been compared to stones rattling in a pot, and is indeed highly guttural, more so than the broadest Scots. But it is terse, pithy, proverbial, expressive in a high degree. It is, of course, an Iranian language in its root-stock, as can easily be shown. But like all languages spoken by Muslims it is enormously enriched, to taste, by abstractions taken from Arabic and Persian. This makes it no more Semitic in its roots than ours is Latin or Greek. A curious thing is that it comes over very easily into English. And it is most exciting to find that, unlike Arabic and Persian, whose prosody goes by quantity as in Latin and Greek, scansion in Pashtu poetry is by stress, the stress falling on every fourth syllable.* We are used to scan our poems, when we attempt it at all, by iambic or trochaic feet on a classical basis, but I believe English verse also really goes on a 4-syllable stress. Take:

Nobly, nobly, Cape St. Vincent to the north-west died away . . .

or

Of man's first disobedience and the fruit . . .

or

And all that mighty heart is lying still.

* For these elucidations I acknowledge my debt to Dr. D. N. Mackenzie of the S.O.A.S.

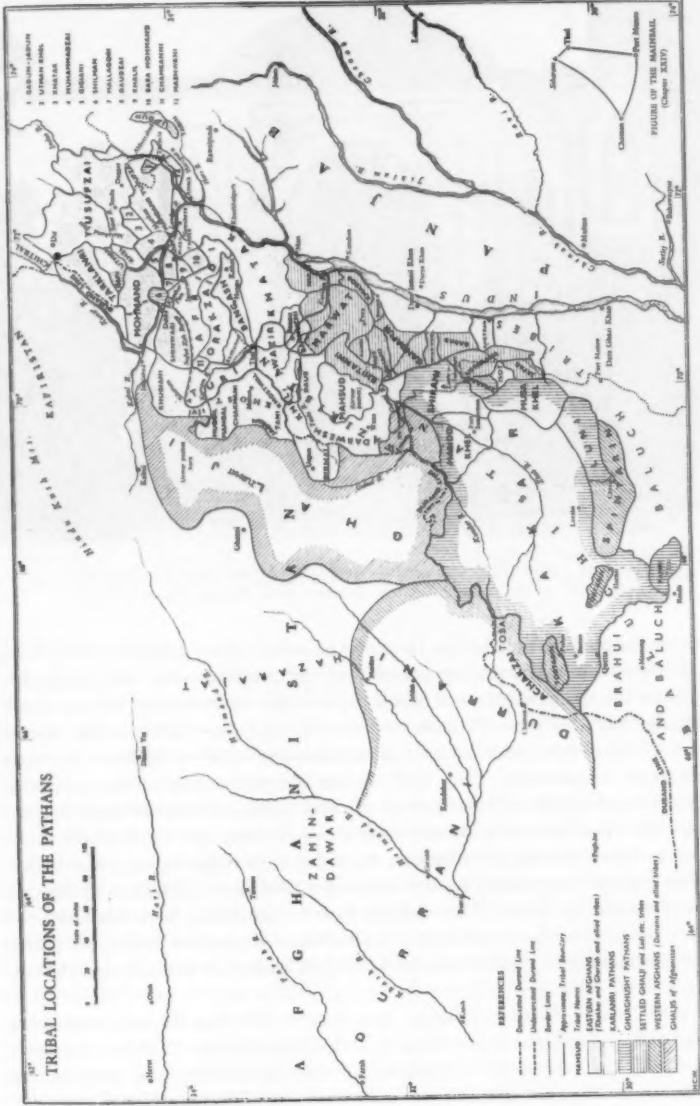


FIGURE 3

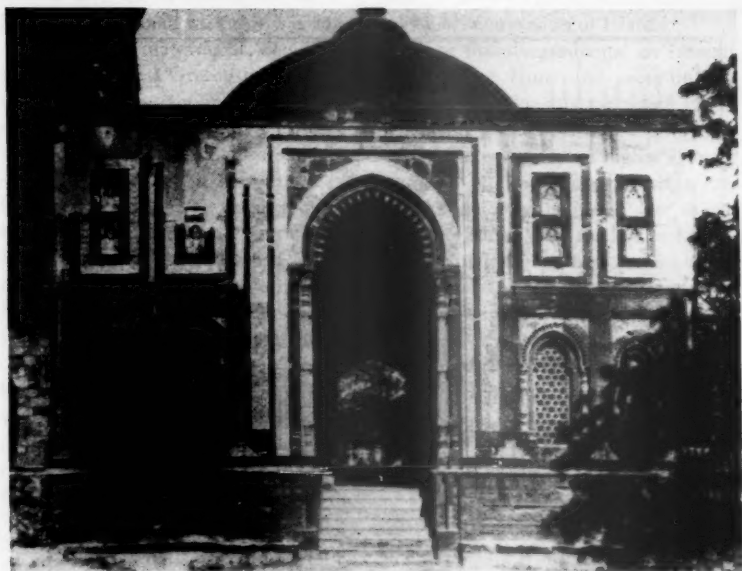


FIGURE 4. *Alai Darwaza, Delhi, below Qutb Minar, built by Alauddin (1296-1316) of the Khalji (Ghalji) dynasty, first Pathan rulers in India*

But we must turn now to the language of stone. The Muslims, whose faith denied them the enjoyment or practice of the pictorial arts, have been distinguished for the grandeur and simplicity of their architecture. And it is not surprising that it is those Pathans who turned their faces towards the ancient culture of Hindustan who have been famous above other Afghans for their architectural monuments. They had become the spear-head of the armies of Mahmud invading the sub-continent (A.D. 1000-1030) and from his time onward through the era of the Ghorids who took Delhi in 1192, and the Turkish slave-kings who followed them, they became more and more important as mercenaries, generals and governors, until in due course the Khaljis, or Ghaljis, won through to the Sultanate of Delhi. This dynasty lasted 1290-1321, with Alauddin the greatest ruler in northern India since Gupta times 1000 years before. It is this Alauddin who may be said to have been the first builder in India in the 'Pathan' style.

Fergusson in his *History of Indian Architecture*, following Raverty, denies the honour of having inspired pre-Mughal architecture to the Pathans. Raverty's ground is that the dynasties in question were not Afghan but according to him 'Turkish slaves, Khaljis, Jats and low-caste converted Hindus'. This is a travesty of fact, for there were three illustrious Pathan dynasties in Delhi, the Khaljis



FIGURE 5. *Tughlak Shah's tomb, c. 1325. The Tughlaks were Turks, not Pathans, but as the poet Khushhal says, 'they had been nurtured by Pathan Kings'*

equivalent to Ghaljis (as already shown), the Lodis (1451-1526), and the Surs (1539-55). And the builders under these dynasties, instead of copying or filching Hindu models, as did the Turkish slave-kings, drew from the undefiled well of Ghazni, where Mahmud and his successors had developed a style essentially arcuate and Muslim, after gathering craftsmen from the then newly-founded Cairo, from Damascus and from Iran.

Muslim architecture in India does not begin with Alauddin; its earlier manifestations are in the mosque and great tower known as the Qutb, 10 miles south of Delhi. But the early Muslim architects, and indeed later ones not inspired by the Ghazni tradition, used Hindu masons and craftsmen and clung fondly to a trabeate form of building, even, as in the courtyard of the Qutb mosque, employing pillars, capitals and vaults torn from Jaina temples. It is the glory of the Pathan dynasties that they adapted to India a style essentially arcuate, of which the inspirations had come from the monuments raised by Mahmud and his successors at Ghazni.

There is a very suggestive passage in Fergusson's book showing that he was groping for a truth which eluded him. Speaking of Mandu, the seat of another Pathan dynasty, he writes: 'It is not easy to understand why the architects of Malwa should have adopted a style so essentially arcuate, while their brethren

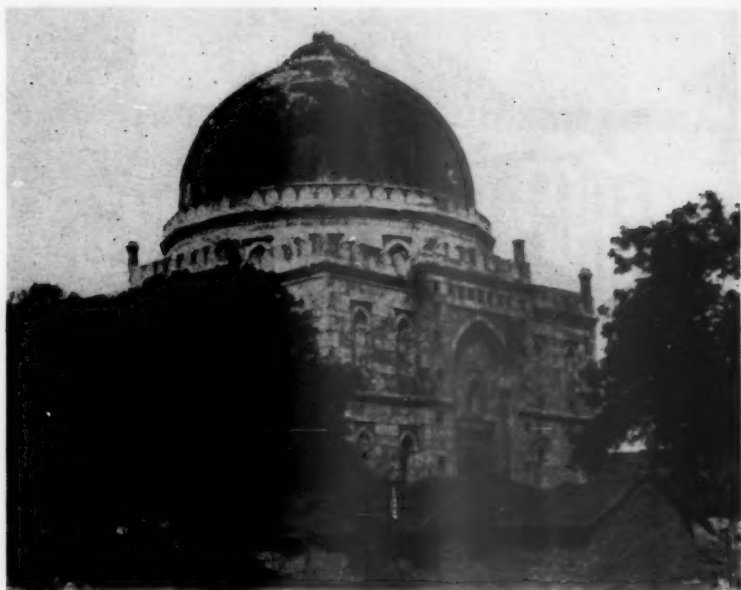


FIGURE 6. *Tomb of Sikandar Lodi, Delhi, c. 1500. (The huts shown in the foreground of this photograph have been cleared away since the garden round the tomb was constructed in 1936, on the initiative of Lady Willingdon)*

at Jaunpur and Ahmadabad clung so fondly to a trabeate form wherever they had an opportunity of employing it. The Mandu architects had the same initiation to the Hindu forms, and there must have been innumerable Hindu and Jaina temples to furnish materials, but we find them neither borrowing nor imitating, but adhering steadily to the pointed-arch style, which is the essential characteristic of Muslim art in other countries.'

The answer is clear enough. It was because these Pathan monuments were built by craftsmen brought from Ghazni and elsewhere by Pathan rulers. These disdained to loot pillars, they did not imitate, they built to the glory of God or to their own fame in mosque, fort and tomb in the tradition of the Muslim world from which they drew their inspiration.

Let us examine a few examples:

1. Dura samadi Ghat, Benares, a simple Hindu trabeate building.
2. Mosque at Jaunpur, mingling of arcuate with trabeate.
3. Alai Darwaza, Delhi, arcuate, built by Alauddin Khalji (Figure 4).
4. Tomb of Firoz Shah Tughlak, arcuate Pathan style (Figure 5). The Tughlaks were Turkish nobles brought up at the Khalji court.
- 5 & 6. Lodi Tombs (Figure 6).



FIGURE 7. *The western gate of Sher Shah's fort, Delhi—the Purana Qila—c. 1545 (from the engraving by Thomas Daniell). Sher Shah defeated the Mughals and founded the third Pathan dynasty in India*

The Lodi tombs are particularly solid and striking, and stand in a pleasant garden just south of New Delhi. They combine an astonishing mass of ashlar—the walls are eight feet thick—with some delicate detail of blue-enamelled tile decoration. The Lodi Kings were the second Pathan dynasty to rule in Delhi; their power endured for 75 years, when in 1526 Ibrahim, the last Lodi, was defeated and slain by Babur, the Mughal invader, on the field of Panipat.

It has been suggested that, even if the Delhi Sultans were Afghans, that does not in itself dignify their architecture as Afghan or Pathan. But admitting that its beginnings can be traced to Cairo or Damascus, that does not make it any less Pathan architecture. Nobody suggests that St. Paul's, or the Royal Hospital or the City Churches are not English architecture because their inspiration can be traced to the renaissance styles of Italy. These Delhi and Mandu monuments are indeed as Pathan as Durham and Tewkesbury are Norman; the fact that Norman architecture is derived from the Romanesque does not lessen our admiration for the Normans as builders, gloriously inspired. Even so were the Pathan sultans of Delhi and Mandu.

For what they did was to achieve a revolution in the architectural style of the sub-continent, developing a fully arcuate technique. The distinction between the trabeate and the arcuate is familiar enough; it can be illustrated by comparing the Greek temple with the Roman and Romanesque basilica. But in other respects

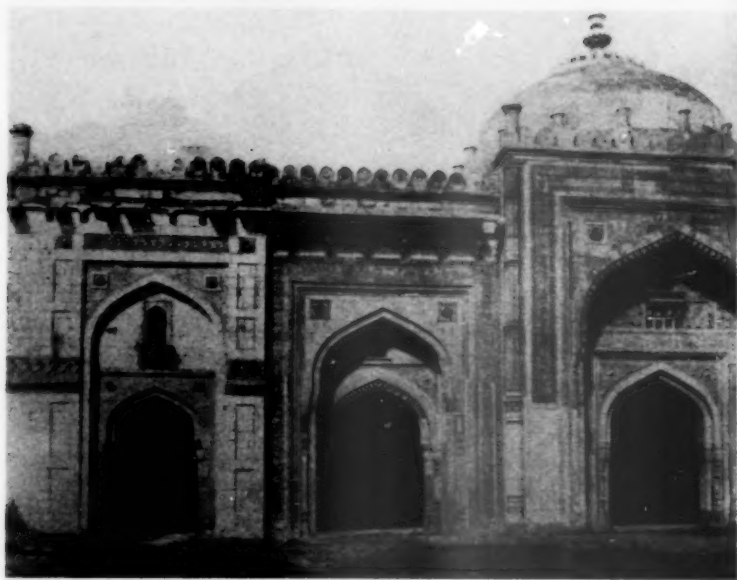


FIGURE 8. *Sher Shah's mosque, inside Sher Shah's fort (Purana Qila), Delhi, c. 1545*

the comparison is not a good one. The Romans vulgarized; they turned the Greek genius for proportion into a lumpy fussiness. On the other hand the Pathan simplified; he substituted clean soaring arches, mass and plain surfaces for the profuse and almost wild embellishment of each available inch, typical of the Indian craftsman.

There remains the greatest of all Afghans in history, Sher Shah, the Sur Sultan of Delhi. He reigned for less than six years (1539-45), but what years!

He restored the Afghan dynasty. In those six years he laid the foundations of the administrative and revenue system, later perfected under Mughal and British rule. There is a host of stories of his attention to detail and his genius in government.

That could be said of many kings. It is as a builder that Sher Shah will be remembered. To see the Purana Qila at Delhi (Figure 7) and the Rohtas Fort in the Salt Range is to recognize the strength of the man. The great battlements of the Purana Qila make the Red Fort of Shah Jahan, three miles away to the north, look like the puny castellations of a child, put together from a box of bricks. Within those ramparts is his mosque (Figure 8), a building with a simple, noble grace, all its own, more in keeping surely with the true aspirations of Islam than any of

those pearly caskets built by the Mughals to the glory of God. Indeed Pathan architecture stands to the Mughal much as does our Norman to the later Gothic.

This is the cream of Pathan architecture, the monument to the genius of a people. To reach the heart, the inner significance, of Sher Shah, it is best to visit his vast frontier fortress at Rohtas. There it stands, the great ramparts growing from the cliff like a wall of China, looking north to the low hills of the Salt Range, and beyond, to the snows of Himalaya. As befits a work of military fortification, these overpowering gates and bastions do not carry the embellishments added to the Citadel at Delhi, but the ashlar is finely jointed and the proportions fill the eye. The conception was Sher Shah's, and in those walls he lives again. Sher Shah is buried in Bihar whence he came, in a fine octagonal

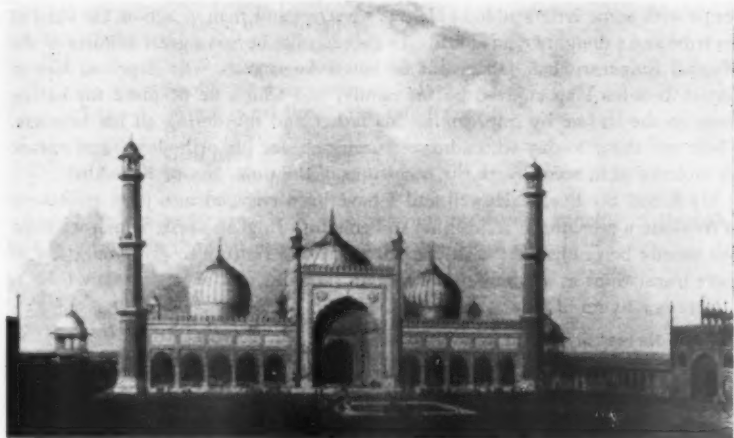


FIGURE 9. *Jami Masjid, Delhi, c. 1650 (from the engraving by Thomas Daniell). A masterpiece of Mughal architecture shown in contrast to the Pathan style*

tomb standing in what in India is called a tank. But his real monuments are Rohtas and the Purana Qila at Delhi.

He was killed by an accidental explosion at a siege, his death leading to the inevitable struggle for the succession and ultimately to the return of the Mughals. The story of his dynasty illustrates forcibly the strength and weakness of Pathan character. A leader arises, great enough to gather men round him and make them forget their factiousness for one crowded hour of glory. He dies and with him dies his inspiration. The effort, steady and sustained, needed to maintain the position won proves to be beyond reach.

As Khushhal, the Pathan poet, has it:

Da Bahlol ao da Sher Shah khabre awram . . .

In days gone by Pathans were Kings in Hind
And still in deeds the Mughal they outdo,
But concord they know not, so have they sinned
Against God's Unity, and come to rue.
Ah God! Grant them but concord, grand refrain,
And old Khushhal will rise, a youth again!

The builder is succeeded by a galaxy of poets, of whom two at least, Khushhal Khan, the Khatak, and Rahman Baba, the Mohmand, of the seventeenth and eighteenth centuries respectively, strike echoes from every Pathan heart. The Pashtu language does not seem to have been much written before the end of the sixteenth century, and Khushhal, who lived 1613-89, probably did something to improve the alphabet. (It is a modification of the Persianized Arabic script with some letters added.) He was a warrior and man of action, the chief of his tribe and a doughty man at arms. In his early life he was a great admirer of the Mughal Emperor Shah Jahan, but he hated Aurangzeb, who deprived him of certain benefits long enjoyed by his family, and whom he despised for having come to the throne by imprisoning his father and murdering all his brothers. There are those to-day who admire Aurangzeb for his orthodoxy, and excuse his violence as in accord with the necessities of the time. Not so Khushhal.

My friend Sir Evelyn Howell and I have been engaged in a joint endeavour to translate a selection of Khushhal's poems into English verse, which we hope will shortly be published. With your permission I venture to give you a few of these translations as a faint echo of Pathan thought.

Here is a hymn of hate against the Emperor:

Ra malum shuh da Aurang adl wa insaf . . .

Aurang, full well I know him. So just is he, so fair,
Precise in all observances, punctilious in prayer.
But he slew his own blood brothers in fratricidal strife,
Gave battle to his father and imprisoned him for life.
The devotee a thousand times may brow to earth incline
Or by repeated fasts may bring his navel to his spine,
But if his act mate not with speech to further good intent,
His posturings are profitless, his fasting fraudulent.
The outward of the snake is fair and glossy is her skin,
But venom lurks behind her lips and treachery within:
The valiant speaks but little, by deeds his praise is sung;
The coward and the braggart make sword-play with their tongue.
My words reveal to him who knows a portrait of Aurang.
My hand can never reach him. Lord, hear me, Lord, I pray!
To Aurang, Lord, be merciless on Thy Great Judgement Day!

That is typical Pathan oratory, and most people who care for Pathans will be on Khushhal's side. But he did not write hate-poetry only; he was a most versatile person. He wrote patriotic songs, odes to the seasons—like most people in those parts he preferred autumn to spring, because the heat is over, the crisp winter

is ahead, and the wild-fowl are winging back. He wrote delicious love lyrics. And he wrote prayers recalling the Psalmist, and a sort of Crossing the Bar.

I will give you a love-lyric in more reflective and in lighter vein. First, the reflective:

Puh zan as puh jahan mi dva siza di mundali . . .

Let old Khushhal confess—
Two things I prize,
In me mine eyes,
In all the world beside,
Where they have loveliness espied,
I prize that loveliness.
Snake-swift a scented tress
Doth all my veins possess;
Divinity, no less,
For me fair forms reveal,
Such ecstasy I feel,
I swoon, my senses reel
Before all loveliness.
All Sense transcended in the Form I see,
Semblance that merges in Reality.
'Where is my Rose?' the bulbul cries.
Where is my Rose? There, would I be
With tears of blood, a sacrifice
To ease my heart's sharp agony.

And in lighter vein, for which an elegiac metre seemed suitable in English. This poem praises the charms of the Adam Khel Afridi girls—

Adam Khele Afridai di sre o spine . . .

Rosy and fair to the eye are the daughters of the Afridis,
Maids of the Adam Khel, lovely, how lovely they are!
Large and liquid the eyes, brows arched, long lashes a-tremble,
Sugar lips, cheeks like flowers, foreheads as bright as the moon;
Proud little heads encircled with dark curls fragrant as amber,
Rose-bud mouths that reveal teeth set in even array;
Soft and rounded the body, and smooth to the touch as an egg-shell,
Ample in hip and thigh, tapered to delicate heel;
Challenge of deep-cleft breasts set above the daintiest waist-line,
Like Alif proudly erect, brighter than silver to see.
Swift as a hovering hawk I ranged over valley and mountain,
Plenty the game that I found, partridges pretty and plump;
Always a bird of prey is the hawk, whether eyas or tiercel,
But the old hawk well tried stoops with a deadlier dart!
Now do I mind how we climbed the steep, steep stairway to heaven,
Over the Matri Pass, yon bonny maidens and I;
Now do I mind how we drank of the waters of Bara and Landai
Sweeter than wine to the lips, sweet as the lips I have loved;
Even so from Tirah did I come with my darlings to Khwarra,
Now are they parted and gone—O, but my heart it is fain!
What though the flame be hidden, the smoke of the fire ascendeth,
So, even so, Khushhal, so is the burning of love.

And here is a trifle, which Horace would have approved, on the old theme of

carpe diem: It is more concentrated than the quatrains of Khayyam, and carries most of his message.

Saki, rakra u ma may . . .

Roses, wine—a friend to share—
Spring sans wine I will not bear,
Abstinence I do abhor.
Cup on cup, my Saki, pour.
Hark, the lute and pipe. Give ear.
What says music to our cheer?

‘Time once flown returneth never—
Idle moments, gone for ever.

Wouldst recall them? Call in vain,
Life, our mortal life, hath sweetness,
As its sweetness, so its fleetness.

Count it nothing. ‘Tis no gain.
Doth time tarry for thy prizing
Or make speed for thy despising?

Time hath all young lovers slain.
Time is heedless, time is heartless.’
Saki, pour and pour again.

The Saki, of course, is the cup-bearer.

And here is an extract from one of Khushhal's Psalms, done into what I hope is the English of Coverdale:

Zuh puh khpalu gunahuno taubagar yam . . .

- ... 5. Mine own familiar friend knoweth not the evil I have done in thy sight:
I even I only among men, have my sins ever before me.
6. No heathen, no unbeliever, is so vile in that he doeth: no man so miserable as I know myself in the inward parts.
7. The heathen ariseth in the night watches to mutter to his gods: I, even I, am more to be despised than the worshipper of graven images.
8. With a thousand thoughts in my heart I stand and bow my head: even so have I prayed all my life long.
8. I exalt thee in the congregation and acquire no merit in mine own heart: yea, my strength availeth not to offer thee due praise.
10. Lord, deliver me from blood guiltiness; even now I am upon the sword to bring the innocent to the grave.
11. Verily, my lust maketh evil that which is good, and good evil: as for me, I am alway helpless before the bidding.
12. My soul delighteth in every unbelief, even three score and twelve: yet am I numbered with the faithful in the outward parts.
13. Lord, I am plunged in the ocean of desire: in the fortress of lust am I encompassed.
14. Verily, if to use vain repetitions is to be a Muslim, well for me: I am numbered in the company of true believers! . . .

The number three-score and twelve is a reference to the 72 heresies detected by the orthodox in Islam. Despite his sins, the poet made great profession of his orthodoxy. And, Crossing the Bar:

Da ahad Badshah puh hukam shwam agah . . .

One King alone I serve, one King obey,
His orders rule my life, his yea, his nay.

The friends I loved stand in thy presence, Lord,
 Wistful and solitary I wait thy word;
 Soon, soon, the call rings out 'Come thou to me'—
 Then here am I, thy slave, I run to thee!
 Hear me, my King, my God! Have I not prayed
 Tears from the heart, and shall I feel afraid?

We seem to hear an echo of Rossetti, and is there not something infinitely touching in the 'I run to thee'—the child answering the father's call?

I have said enough, perhaps too much, to stress the extraordinary range and versatility of this poet, great by any standard. It is worth while to dwell at some length on Khushhal's thoughts and words, for he is a Pathan of Pathans. With all his weaknesses, with all his vainglory, there is something splendid about the man. To understand him is the beginning of knowledge for him who would know Pathans.

Rahman Baba, an affectionate 'Papa Rahman' synonym for Abdurrahman of Hazar Khani near Peshawar, was a very different sort of poet—a man of quiet thought, withdrawn and saintly, one who, tinged deeply with Sufism, thought of human desire but as a faint image beckoning towards a mystic union with the Divine. By many Pathans he is more esteemed even than Khushhal, but the line of his thought does not come over in English so easily, and we have not attempted to set him in English verse. But may I give you one of his simpler lyrics in prose translation? It is on the theme of contrast, the balance of joy and sorrow, of good and evil:

This is the beloved—that is the rival;
 This is the rose—that the thorn:
 This is the rose—that is the thorn:
 This is Christ* and that the Cross.
 This is the beloved—that her companion:
 This is the treasure—that the snake that guards it.
 This is wisdom—that is desire:
 This is sorrow—and that the consoler.
 This is parting—that is union:
 This is autumn dying—that the fresh spring.
 This is worship—that is sin.
 This is light—that the fire that burneth.
 This is the wise—that the fool:
 This is he that waketh—and that the sleeper.
 This is Rahman—that the adored;
 This is the sick—and that the healer.

Ahmad Shah, we have seen, founded Afghanistan in 1747, realizing an Afghan State in the home-lands for the first time in history, and bringing the Durrani, as against the Ghaljis, to the forepart of the stage. He was an Abdali of the Saddozai sept, and it is from his time that the Abdalis took on the name Durrani from Ahmad Shah's assumed title as ruler, Durr-i-durran, Pearl of pearls. Ahmad Shah was a great man, one of the three greatest Afghans in

* The actual words are: 'This is Mansur—that the gallows'. Mansur was a Sufi, put to death in Baghdad for saying 'I am God'. The sense is as I have given.

history. He himself, a Western Afghan and therefore with a Persian bias—he had come to fame as commander of the bodyguard of Nadir Shah, King of Iran—was able to weld together for a time in one Kingdom all the Western and Eastern Afghans, and indeed to control India as far down as Lahore. But, like Khushhal, Ahmad was not only a man of war. He was one disposed by nature to mildness and clemency, when the way lay open. He was a King who never lost the common touch. And, for our purposes more interesting, he wrote poetry, and what is more he wrote not in Persian but in Pashtu.

Ahmad was only 50 when he died after a life packed with achievement. In his last years he suffered much from a malady of the face, probably cancer. His last poem echoes both his pain and his friendships, and is full of pathos. Here is a prose translation:

Woe is me for the sweet life that passeth,
That floweth past like a stream and is gone!
O heart! What canst thou but grieve
When man's being bloweth away as the wind?
Though thou hast builded mansions in all grace and form,
Thou must pass and leave them, sorrowing.
Grieve, and forever grieve, O my heart,
That friends who love must part so soon!
Those we love are as dainty flowers of spring
That wither in the heats of summer.
Wouldst have a friend? Make friends with parting,
For parting comes to him who loves.
Friendship is the rose that bears the thorn,
The thorn that hardens and pierces the heart.
But why sorrowest thou, Ahmad, when all is joy,
When sounds the drum of meeting and the hour of union approacheth?

The last couplet is Sufic—parting from earthly friends is turned to the joy of union with the Divine. And the couplet 'Though thou hast builded mansions . . .' recalls Horace's heartbreak:

*Linquenda tellus, et domus, et placens
Uxor; neque harum quas colis arborum
Te, praeter invisas cupressos,
Ulla brevem dominum sequatur.*

In due course the British have given way to a Pakistan which in a very real sense is the heir to the Mughals. What part are the Pathans destined to play in this Pakistan?

I have failed of my purpose if I have not shown that one half of the Afghan peoples—we can call them Pathans if we like, but they are as entitled to the Afghan name as any Afghan within the present Afghan State—not only live in Pakistan but are the heirs of a tradition which has always looked towards the Indo-Pakistan continent, once as Sultans of Delhi and later as vassals of the Mughal empire. These are the Eastern Afghans who in their time built monuments

of their splendour second to none in the sub-continent, who boast a literature with poets of the stature of Rahman Baba and Khushhal. Mountstuart Elphinstone, in 1809, the first and without doubt the greatest of our race to have dealings with them, wrote of the Afghans round about Peshawar in these memorable words: 'Their vices are revenge, envy, avarice and obstinacy; on the other hand they are fond of liberty, faithful to their friends, kind to their dependants, hospitable above all, brave, hardy, frugal, laborious and prudent.' And of the official deputed by the King Shah Shuja as his personal escort, he wrote: 'He was a grave old gentleman, shrewd, sensible and good-humoured, but somewhat passionate.'

The first assessment is a fine picture of a man; who could help liking those vices with the virtues on the other side? The second reminds me of that great gentleman Dr. Khan Sahib, who, though I had twice put him behind bars, bore no grudge, but (somewhat passionately it is true) was willing to work with me as my Chief Minister.

An Englishman may be allowed to say that he thinks the Pathans have been enriched by sharing for a full century in what we may perhaps call the Indo-British synthesis. There is no doubt whatever, looking at the matter reciprocally, that all of us who have been privileged to know Pathans have liked them—may I even say loved them? It has been my object here to demonstrate that they are a people with a history, an art and a literature of which they may be proud and of which the outer world does not know enough. They need have no fear that they will not pull their weight in the larger organism of Pakistan; they are like the Scots in Great Britain. Like other Highlandmen, they are already largely in control of the fortunes of their country. Macmillan is matched by Ayub; Burns by Khushhal.

POSTSCRIPT

In discussing the arcuate tradition in Muslim architecture the lecturer threw out the suggestion that opportunities will arise of giving expression to it in the building of Pakistan's new capital at Islamabad, near Rawalpindi. Even in an age when reliance on ferro-concrete has caused a wide reversion to the trabeate style, it would be unfortunate if that central and magnificent feature of Muslim building, the arch, should fail to find a place in any new construction designed to give modern form to inspirations which are rooted in history.

DISCUSSION

THE CHAIRMAN: I think you must have gathered by now that the Pathans have all the human weaknesses—perhaps one reason why the Pathans and people from this country got on well together is that they shared those weaknesses! I know how much the Pathans liked meeting the British officers who served on the frontier; it was amazing how soon the British officers picked up their language. They both liked outdoor life, they liked the chase, and they both liked taking a bit of risk, a gamble. I hope that association will continue and that many young men from this country will travel and will visit those historic sites which are now a part of Pakistan.

I believe Sir Olaf is now ready to answer questions. I should like to ask the first. How is it that the Pathans did not go across to Chitral over the Lowarai Pass? Was it the obstacle or the fact that they spoke a different language then?

THE LECTURER: They were and are a different people altogether. I should say the reason was that up in those Chitral hills (they are among the largest cluster of mountains in the world—over 25,000 feet) there is very little cultivated land, and the Pathans did not think it worth while. There are about fourteen languages talked within about twenty miles of Chitral, and I think what happened was that as these waves of conquest, including the various conquests which made up the Pathans, came down into this region of Central Asia the earlier inhabitants were pushed up into the higher valleys, and the later arrivals did not think it worth while going across these passes into these very barren valleys where there was practically no arable land.

THE CHAIRMAN: Sir Olaf recited some of the poetry of Khushhal, our famous poet. I think there is at least one Khatak here if not more, and an Afridi too, but I should like to say that in Khushhal's poem against the Mughals I think he praised the Afridis who escaped to Tirah, rather than the Yusufzais. I think the Khataks still keep up that friendship. As an example, Mr. Farouq's son and my children, and his father and myself, are keeping up that tradition. Khushhal was a great Khan, a sort of squire, and his battle against the Mughals, who were also Muslims, was really a battle for freedom. Although the Mughals were brother Muslims the Pathans resented their conquering that country and ruling it, and I think that as long as that spirit for freedom lasts, Pakistan (of which the Pathans are an integral part) will go on. That spirit, too, is the secret of this great country. It is the refusal to be beaten or admit to being beaten. I think Khushhal's poems play a big part in making the Pathan what he is, in spite of his weaknesses!

MR. P. K. SHAHANI: I should like to ask Sir Olaf why he subordinates Mughal architecture to Pathan architecture, when one of the wonders of the world is Mughal architecture? Secondly, what particular form of Pathan architecture does he think should be adopted in the construction of the new capital of Pakistan?

THE LECTURER: Well, I was careful to say that it was just as some people prefer Norman and some people prefer Gothic, but I think one can admire both of them in their different ways. It depends on your mood, perhaps. If you are feeling very masculine you probably prefer Pathan architecture, if you are feeling more spiritual, perhaps, you prefer Mughal. I must leave everybody here to say whether they prefer the Jami Masjid or Sher Shah's Mosque. I certainly would not depreciate Mughal architecture, because I think it is some of the most beautiful Muslim architecture in the world—look at the Jami Masjid or the Taj Mahal. All the same, the earlier Pathan architecture which led up to it, and brought the arch into India, is very magnificent.

As regards your second question—what particular form of Pathan architecture should be adopted by the architects of Islamabad—I do not think I could advise. All I would say is that I think that the effect of the arch should not be forgotten. Look round London. There is not a single great arcuate building being built now; they are all like match-boxes. It seems to me a great pity that we are forgetting the arch in Europe and I hope it will not be forgotten in Pakistan.

MR. A. S. BENNELL: I think it would help any prospective visitor to Pakistan if Sir Olaf were to mention, say, the three places where he thought Pathan architecture could be best seen.

THE LECTURER: Well, the most interesting Pathan architecture is in Delhi. Delhi was the Muslim capital of India for nearly seven hundred years. Also in Mandu, which is in Malwa, and a certain amount in Bihar. These are in India. Rohtas, the great military fortress which I showed you, is in Pakistan, between Jhelam and Pindi, and it is very magnificent. The rich parts of the sub-continent lay farther south, so that the Pathan invaders went where the capital was, and where the richness was, and they did not stay hanging about near Pindi. In those days there was no irrigation

in the Punjab, and although the Peshawar Valley is naturally very wealthy it has been swept by invasion so often that there is practically not an old building left in it. In Pakistan the best place to go to is Rohtas; next you must go down to India. There are two Rohtas, do not go to the Rohtas in Bihar for Pathan art.

THE CHAIRMAN: Before I thank Sir Olaf, I should like to enlarge on what I said a little earlier about missionaries. It is amazing that even in the toughest days of the frontier, missionaries and doctors used to roam about looking after the people, and although the Pathans were quite capable of taking a pot-shot at people like Sir Olaf, the missionaries were quite safe. In other words they were respected for all the good work they did. I know of one very fine mission school in Bannu, entirely patronized by the Mahsuds, who I should say are even to-day the wildest of the wild tribesmen.

On your behalf I should like to thank Sir Olaf for a very interesting talk, which I am sure will stimulate an interest in the part of Pakistan about which he spoke. I hope that those who are interested in what sort of buildings we should have, and whether they should be Mughal or Pathan, will go out and see them for themselves, and I hope they will send a long list of suggestions to President Ayub Khan.

I am grateful to Sir Olaf on my own behalf, particularly for teaching me so much about my own people and about our own poetry. That usually happens. I know when I was in Australia a few years ago, I travelled a lot, and whenever I talked to a friend, shall we say in New South Wales, about Western Australia or Queensland, or a lot of those far away places, they all admitted they had never been to them. In a short time I knew more about Australia than the Australians. In the same way I think Sir Olaf is a master of the Pathan land, if you can call it that. Once again I should like to thank him, on my own behalf, and on behalf of the audience; and I should also like to thank the Royal Society of Arts for giving us the opportunity of listening to him.

The vote of thanks to the Lecturer was carried with acclamation.

SIR JOHN WOODHEAD, G.C.I.E., K.C.S.I. (Deputy Chairman, Commonwealth Section Committee): I would ask you to accord a very hearty vote of thanks to our Chairman. We are very grateful to him for coming to-day, and it is an honour to have a great Pathan in the Chair on this occasion. May we also extend a welcome to the High Commissioner's lady, Begum Yousuf. We are very pleased that she has been able to attend.

The vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

GENERAL NOTES

EXHIBITION OF COMMONWEALTH ART

As announced on p. 852, the Society has undertaken to give practical assistance to the Joint Commonwealth Societies in arranging an exhibition of Commonwealth Art at 5 Carlton Gardens, London, S.W.1 (until recently the home of Lord Bossom), from 22nd November until 2nd December. The exhibition is part of the activities planned for the 'Commonwealth Weeks' organized by the Commonwealth Relations Office in London at this time, and it will include a selection of pictures and sculpture by members of the Young Commonwealth Artists group, and works by established artists from the Commonwealth. There will also be a section devoted to rare books and manuscripts lent by the Royal Commonwealth Society.

There will be no charge for admission to the exhibition, which is to be on view from 11.30 a.m. to 7.30 p.m. on all weekdays.

EXHIBITION OF NIGERIAN ART

To coincide with the celebration of Nigeria's independence, a large collection of works of Nigerian art is being shown at the Arts Council Gallery, 4 St. James's Square, London, until 5th November. There are over 300 works of sculpture in the exhibition, including an important group lent by the British Museum, and some rare pieces only recently discovered which have been collected in the Nigerian bush by Mr. Bernard Fagg, and lent by tribal chiefs. A number of these are sacred objects used in tribal ceremonies. The earliest works of art on display are three human heads in terracotta dating from the third or fourth century B.C., which were found in the tin mines of northern Nigeria.

There is a charge of 1s. 6d. for admission to the exhibition, which is on view from 10 a.m. to 6 p.m. on Mondays, Wednesdays, Fridays and Saturdays, and from 10 a.m. to 8 p.m. on Tuesdays and Thursdays.

'LADY OF FASHION': HEATHER FIRBANK

An exhibition to delight students of fashion is being held in the New Acquisitions Court of the Victoria and Albert Museum until 4th December. It comprises twenty-two complete outfits bought and worn by Miss Heather Firbank (sister of Ronald Firbank, the novelist) between 1908 and 1921. In the latter year Miss Firbank had all her spare clothing packed into trunks, where it remained unopened for 35 years, and it is from the contents of these trunks that the exhibition has been furnished. Miss Firbank had taste, and the money and leisure to indulge it. She chose her clothes at some of the best known London dressmakers of the period, and the present display includes their designs not only for the changes of dress worn in the course of a normal day by a modish woman of the time, but outfits for special occasions such as motoring and golfing, garden parties and the opera.

STUDIES IN THE SOCIETY'S ARCHIVES XIV

A CAMPAIGN TO PROMOTE THE PROSPERITY OF COLONIAL VIRGINIA (i)*

Alarmed by the declining prosperity of the colony, the General Assembly of Virginia established a committee in 1759 for the purpose of encouraging economic diversification. In a limited sense, this committee was a progenitor of the Virginia Department of Conservation and Development. It also encouraged the establishment of some industries and engaged in some promotional work such as is associated to-day with the activities of a chamber of commerce.

This committee consisted of nineteen prominent political leaders. Their duties were to raise and administer a bounty fund, and to correspond with 'all such persons as they shall judge may give them any useful insight or intelligence in any art or manufacture'. The Assembly itself appropriated one thousand pounds to be used for bounties and stipulated that no one bounty should exceed twenty pounds. It required the committee to keep a journal of their proceedings, and to publish in the *Virginia Gazette* lists of bounties offered and an account of any useful discoveries or inventions made.¹

Charles Carter, Senior, a Burgess from King George County, who had promoted diversification substantially in the management of his own plantations and other business affairs, sponsored this law.² A leader in the Assembly, he became chairman of the committee of nineteen named in the Act, and conducted most of the correspondence with the Society of Arts of London. It is with the activity of this committee with the Society that the present study is chiefly concerned.

* Reproduced from *The Virginia Magazine of History and Biography*, Vol. LXVII, No. 4 (1959), by kind permission of the Editor.



A mid-eighteenth century wharfside scene in Virginia (from Fry and Jefferson's 'Map of the Most Inhabited Part of Virginia', 1751; reproduced by permission of the Trustees of the British Museum)

When the Society was notified by a letter from Lieutenant-Governor Francis Fauquier of the formation of the Virginia Committee, it promptly sought to correspond with it.³ The letter of invitation was written on 1st July, 1760, and Fauquier communicated its contents to Charles Carter, who read it to six members of the committee meeting in the Capitol at Williamsburg on 8th October, 1760. Those present besides Carter were John Blair, Peyton Randolph, Edmund Pendleton, Benjamin Harrison, Lewis Burwell and William Digges. They accepted the invitation with evident pleasure and directed Carter to make an appropriate reply. Thus began a correspondence between Carter and Peter Wyche, Chairman of the Committee of Agriculture of the Society of Arts, which lasted several years.

Charles Carter (1707-64) was a son of Robert ('King') Carter and a brother of both Robert Carter of Nomini Hall and Landon Carter of Sabine Hall.⁴ After some training in Latin and other subjects at school in England, Charles had returned to Virginia before he was 17 and plunged into planting and other business in the colony, including the mining of copper near the present boundary of Fairfax and Loudoun counties.

When his father died in 1732, Charles inherited many plantations. He moved first from Urbanna to Stanstead, above Falmouth, and then, later, to Cleve, near Dogue, in King George County, which was henceforth his residence.⁵ In his will he stated that he had begun a new method of agriculture at Cleve and desired that the plan be carried out in accordance with the directions set forth in *A new system of Virginia Husbandry, or the Little farm improved wherein the business of making Tobo., farming, improving lands and making Wine, are largely treated of and earnestly recommended*, which he had written, he declared, for the benefit of his children. Moreover, the will reveals that Carter was engaged extensively in raising wheat, milling flour, and the baking of ships' biscuits.⁶

Little seems to be known of the life of Peter Wyche. He was elected a Fellow of the Royal Society in 1745 and he may have been descended from his seventeenth-century namesake, who was also a Fellow of that Society. Wyche became a member of the Society of Arts in 1755 and worked actively on its behalf until his death eight

years later. He was chairman and an originator of the Committee of Agriculture, and in his obituary by 'A brother member of the Society of Arts' in the *Museum Rusticum*, it was stated that 'to him alone is entirely owing the correspondence which the society carries on with our American Colonies.'⁷

In his first letter to Wyche,⁸ Carter set forth the necessity for Virginia to get away from its unhealthy economic dependence upon tobacco. In support of his position, he declared that most of the inhabitants were engaged in tobacco raising and were exporting nearly 60,000 hogsheads of tobacco a year, each hogshead weighing upon an average of 900 lb. If this trend continued, he felt that the supply of tobacco would soon exceed its consumption and the consequence to the colony would be inevitable ruin. Besides, consumption might quickly decline because tobacco was a luxury, subject like other luxuries to the fickleness of fashion. Then, too, it was harmful to the health. 'Indeed', he warned, 'if the common Consumers were sensible of the great Proportion of poisonous Quality contained in this Narcotick Plant, they would be induced to lay it aside, to preserve their Healths & save their Money.' Moreover, the high duties on tobacco had already 'given rise to so many Frauds' that honest traders could not sell it at a profit at prevailing low prices, and hence the planters could not obtain enough money from its sale to supply themselves with necessary manufactured goods from Great Britain.

Carter then directed his attention to definite ways for diversifying the economy of Virginia which would be mutually beneficial to the colony and the empire. He proposed the production of iron, tar, pitch, turpentine, hemp, flax, masts and other wood products, saltpetre, fisheries, and wines. In advocating these products he declared that the colonies could soon supply Britain with iron equivalent in quality to the best Swedish. Tar, pitch and turpentine could be had in abundance, and the production of white tar should be encouraged immediately because it was far superior to ordinary tar in the manufacture of cordage. Hemp was 'extremely natural' to the soil and climate of Virginia and could be raised in ample supply for the entire empire if the British Government would restrain the importation of Russian hemp. Flax also grew well in the colony and with proper encouragement 'sufficient Quantities fit for sail cloth might be annually exported'. An ample supply of mast yards and all other useful timbers of the fir were already being produced in the northern colonies.

If the methods used in the East Indies, France and Prussia were adopted, Carter claimed, Virginia could also produce large quantities of saltpetre. It had 'in all the back Parts various Places where the Brute Creatures are wont to lick the Salt'. From such a saltlick Carter declared he had made good saltpetre and used it successfully in curing bacon. Moreover, he had found that all the soils on which tobacco grew abundantly were 'charged with Nitre'. Using the Virginia saltpetre, sulphur and charcoal, he had made 'a strong Pistol Powder', as strong as any he had ever imported from Britain.

As for ordinary salt, he believed great beds of it were to be found along the rivers above the fall line, much strong salt water was in the bay and ocean, and on the seaboard side of the Eastern Shore it was said that the sedge of the marshes was covered with salt in the summer, which the common people cut and beat off for the use of their families. It was a pity, he continued, that an exclusive patent for making salt in America had been granted to Andrew Read. Read still had not begun a salt work in Virginia and his monopoly on salt making should be revoked. Likewise, Carter urged that the British should abolish their monopoly of supplying salt to the southern colonies. By using Lisbon salt, the foundation could be laid for 'a most glorious herring Fishery', without interfering with the British fishery. Carter was not alone in his desire for the coarse salt of Lisbon; North Carolinians also found that the British salt monopoly interfered with the development of their fisheries.⁹

Fish were to be had in abundance, he declared. From December to April vast schools of herring came out of the sea into the inlets of the Carolinas and into

Chesapeake Bay and its estuaries to spawn. But the salt obtainable from Great Britain was either too weak or too small to preserve them. Many trials had proved that they could not be cured properly unless the salt was of a grain of the size of 'english Pease which as it dissolves is continually strengthening the Pickle and keeps the Fish cool'. Carter suspected that the schools of herring which touched the coast of Virginia were performing a circuit around the Atlantic and that they arrived on the coast of England in June.

Besides the herring, Virginia had many other fish, such as 'Corbits, Drums, Bonettas, Rocks, Shads of various Sorts, and old Wives'. The 'old Wives' were so fat in the month of September, Carter said, 'that by pressing them, without Prejudice to the Fish, a Gallon of Oil has been made out of a Hundred'. Quantities of sturgeons were in the rivers from March to the middle of September. From them, Great Britain might be supplied with a 'delicious Food and Caviary', if persons skilled in curing such fish could be prevailed upon to come into the colony.

In his discussion on the propagation of grapes, Carter confessed he had never heard of the 'Zant and Cephalonia' until he had seen a letter from Wyche (probably the one written to Fauquier). Nor could he say anything about the value of other grapes of the Mediterranean, since he was 'very little acquainted' with their wines. Instead, he would choose to cultivate the varieties of France, Spain, Portugal, Madeira, Fayal, Teneriffe and the Canary Islands.

The best method he had yet found for propagating grapes was to place the

Cuttings about two Foot and a half long in Rows in a Trench with the lower Butt twisted, either with or without a small horse Bean put in the Split, at any Time between the last of October and the last of February, there to remain till November following, in which Time they will have formed many Roots, then they are to be taken up and put as thick as possible in Tubs with Holes in their Bottoms, or Baskets, and some of the Earth that they werent in, made into a thin pappy Consistance, so as to fill up the Interstices between the Roots and Stems.

If seeds of the various varieties of grapes could be quietly procured from the various foreign countries, without giving offence to any power who might think Virginia intended to rival them in the production of wine, Carter was willing to try to grow vines from them. He also desired that some currant grapes be sent, together with a description of methods for curing them. Already he was making some wine from a winter grape which was 'so nauseous till a Frost that the Fowls of the Air will not touch it', and he had made 'from a Vineyard of white Portugal summer grapes some light pleasant white Wine'.

Virginia's interest in grapes was an old one. Lord De La Warr had brought Frenchmen to the colony to dress vines as early as 1610; and Sir Edwin Sandys had exuberantly reported to the officials in London in 1619 that the Frenchmen in Virginia thought vines would grow even better there than in France.¹⁰

Turning to sericulture, Carter declared that he had often found in Virginia moths similar to the Bombyx and had attempted to produce silk from them by hatching their eggs and feeding them on mulberry leaves, but that he had failed to raise any. During the next season he intended to try feeding them on leaves of the apple and other trees.

In this sort of experimentation Carter was hardly the pioneer. Like the attempts to produce wine, the experiment with silk production had been carried on over many years with only minor success. Captain John Smith witnessed the first attempt. On 2nd August, 1619, the first General Assembly had enacted a law requiring every man to plant and maintain in growth each year at least six mulberry trees,¹¹ and Sir Edwin Sandys had informed the London Company in 1620 that some indigenous silk worms had been found in the native mulberry trees of Virginia.¹²

Yet in Carter's century a naturalist found the people still ignorant of the art of silk making.¹³

(To be continued)

ROBERT LEROY HILLDRUP*

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2. H. R. McIlwaine, ed., *Journal of the House of Burgesses of Virginia, 1758-61* (Richmond, 1908), pp. 88, 109, 120, 124, 128; *Legislative Journals of the Council of Colonial Virginia* (Richmond, 1918-19), Vol. III, p. 1215.
3. Royal Society of Arts, Guard Books (hereafter G.B.), Vol. IV, No. 141. F. Fauquier, 22nd April, 1760.
4. [William G. Stanard] 'Virginia Council Journals': *The Virginia Magazine of History and Biography* (hereafter *V.M.H.B.*), Vol. XXXII (1924), p. 20.
5. Fairfax Harrison, 'The Will of Charles Carter of Cleve': *V.M.H.B.*, Vol. XXXI (1923), pp. 39-42.
6. *Ibid.*, pp. 64-5; W. G. Stanard, 'Harrison of James River': *V.M.H.B.*, Vol. XXXII (1924), p. 98.
7. *Museum Rusticum et Commerciale*, Vol. I (London, 1764), p. 197.
8. G.B., Vol. VI, No. 47, C. Carter. Received 6th May, 1761.
9. R. L. Hilldrup, 'The Salt Supply of North Carolina during the American Revolution': *The North Carolina Historical Review*, Vol. XXII (October, 1945), p. 394; William L. Saunders, ed., *Colonial Records of North Carolina*, Vol. V (Raleigh, 1887), pp. 322-4.
10. Lucian J. Fodick, *The French Blood in America* (New York, 1906), pp. 15, 345.
11. H. R. McIlwaine, ed., *Journals of the House of Burgesses of Virginia, 1619-1658/9* (Richmond, 1915), p. 10; Charles E. Hatch, 'Mulberry Trees and Silkworms: Sericulture in Early Virginia': *V.M.H.B.*, Vol. LXV (1957), pp. 3-61.
12. William Stith, *The History of the First Discovery and Settlement of Virginia* (New York, 1865), p. 177.
13. [?] John Mitchell, *American Husbandry*, ed. Harry J. Carmen (New York, 1939), p. 192.

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OBITUARY

We record with regret the death of three Fellows of the Society:

MR. GEORGE ARCHER

Mr. George Archer, C.M.G., who died on 20th September, aged 64, was President of the Mond Nickel Company and a former Civil Servant of great experience and capacity. He entered the Civil Service in 1913, and after the war, during which he served in the R.N.V.R., he joined the Customs and Excise, and subsequently worked for the Import Duties Advisory Committee and other Government departments. In 1939 he moved to the raw materials department of the Ministry of Supply, and two years later went to Washington, where he served successively as Secretary-General and Head of the Raw Materials Mission organized by the Ministry. From 1942-5 he was also United Kingdom Secretary of the Combined Raw Materials Board. He joined the Board of Mond Nickel in 1948 and became in turn Sales Director, Managing Director and Chairman of the Company before his appointment as President in July of this year.

Archer was made C.M.G. in 1945. He was elected a Fellow of the Society in 1955.

MR. A. W. SEYMOUR

Mr. Alfred Wallace Seymour, C.M.G., who for two periods served as acting Governor of Trinidad and Tobago, died on 2nd October, aged 79. He made his early career in the Ceylon Civil Service and held various posts in Ceylon, including those of Government Agent for the North Central Province, and Registrar-General, before his appointment as Colonial Secretary of Fiji in 1927. From 1935-8 he was Colonial Secretary of Trinidad and Tobago, and it was during these years that he was also called upon to assume the chief responsibility for the government of the Islands.

Mr. Wallace was elected a Fellow of the Society in 1950.

MR. HORACE WRIGHT

Mr. Horace Wright, who died at Edgware, Middlesex, on 12th September, aged 72, was a much respected businessman in that neighbourhood who gained a considerable reputation as an artist. In 1918 he set up as a chemist in the High Street of Edgware, which then still preserved an almost village-like character. During the next forty years his unflinching delight in drawing and painting local scenes of historic and architectural interest coincided with a period of extensive urban development, with its attendant destruction of relics from the past, so that in addition to their artistic merits, his works have an enduring topographical value. A number of Wright's pictures were hung in the Royal Academy, and many of them enjoyed a wider public through reproduction in the periodical press. He also illustrated the guide books published in the 'Garden of England' series.

Mr. Wright was elected a Fellow of the Society in 1945.

NOTES ON BOOKS

THE PENROSE ANNUAL: A REVIEW OF THE GRAPHIC ARTS. *Volume 54. Edited by Alan Delafons. London, Lund Humphries, 1960. 42s net*

The Penrose Annual, now well past its half century, has, in the last year or so, achieved under the editorship of Alan Delafons a much greater homogeneity. Once something of a printers' pie, it is now an interesting and well-balanced symposium of printing art and printing techniques. In this particular volume, the printing arts are, at least to this reviewer, more interesting than the printing techniques. The very modest two guineas charged for this very well-designed and well-printed book, would be, as far as I am concerned, a fair price for just two of the many excellent articles. Firstly, the late Peter Floud's fascinating description 'The Wall Paper Designs of William Morris' and secondly for Kenneth Garland's awkwardly titled 'Structure and Substance'. This article is a matter of true concern to every member of this Society. Most writers on the aesthetics of modern design tend to express themselves by the most complex and involved language. Kenneth Garland avoids this pitfall and wades in boldly with clarity and economy of words. He traces the development of modern graphic design from the Arts and Crafts Movement 'providing an anaesthetic and not a stimulant to modern industry' to the art movements of the 1920s and the work of De Stijl, the Expressionists, Dadaists and Constructionists, who between them provided a basis for modern graphic design. All these movements were utilized by the teachers at the Bauhaus (but save us from Bauhausmen—some primitive tribe from the uplands of the Ruwenzori?). The application of De Stijl's formal geometric principles to typography produced clarity and an objective approach to problems of printed design.

Kenneth Garland makes an interesting comparison between American and European printed design. The Germans, and the Swiss after them, being firm believers in regimentation, produce impeccably precise but completely anonymous designs.

The Americans, on the other hand, believing in empiric solutions and also in the rights of the individual, have given a welcome gaiety to the arid Bauhaus stuff. The work of such designers as Saul Bass, famous for his credit titles for the film *Round the World in 80 Days*, is completely personal. The substance here is more important than the structure. This excellent article ends with: 'These men [the working British designers and typographers] are not concerned with anything so highflown as "raising cultural standards" or so dilettante as "giving that extra something that only the artist can supply". Their business, if only they will acknowledge it, is communication. . . .'

Of the many other interesting articles, Sem Hartz writes with understanding about Jan van Krimpen, Paul A. Bennett on 'Typophile's Adventures in Book-making', Stanley Hickson about some of the more rewarding aspects of an Art School's Curriculum, J. M. Mosley (the newly appointed Librarian to St. Bride's Printing Library) writes on 'Person's Greek Types', Charles Mansell on 'Work Study' and D. M. Evans on the unlikely association of 'Cockroaches and Book-binding'. There are two articles on facsimile transmission of daily newspapers—one of these from Japan, and an article on four-colour photogravure newspaper illustrations and the registration of the rotary letterpress sections. The insert for this article, a special edition of the French paper *Le Dauphine*, has the most impressive colour work, but this quality is true of most of the inserts in Penrose, though the design of many leaves much to be desired, and not for many years has Penrose shown anything quite so repulsive as the combination, printed on cellulose film, of a nylon stocking bag and a Cadbury chocolate wrapper.

JOHN LEWIS

POEMS AND DRAWINGS IN MUD TIME. By John Best and Rigby Graham. Leicester, Orpheus Press, 1960. 15s net

THE WOOD ENGRAVINGS OF JOAN HASSALL. With an introduction by Ruari McLean. London, O.U.P., 1960. 21s net

John Best the poet and Rigby Graham the artist appear to have set out to achieve a duet, a unity of expression between word and line, like that of a well-matched tenor and baritone. John Best is certainly the tenor, and Rigby Graham the baritone, in *Poems and Drawings in Mud Time*. The poems are consistently in a lighter vein than the drawings, and more consistent in general quality, for the poet has really set out to achieve less than the artist has. This implies that the concert has not been altogether as successful as it might have been, and this is true, though the result is impressive enough, and this is a book to buy both for the poems and the illustrations, and the excellent design and production of the Orpheus Press and Douglas Martin. Mr. Martin's typography goes far towards suggesting that the unity of artist and poet has been achieved. The emphatic drawings are balanced by poems set in Erhardt semi-bold type, an unusual but effective choice, with titles in a loose, and less successful, hand script. The book has the tangible quality of a fine edition.

Mr. Best's poems are strong, angular, sometimes spiny, seldom easy flowing, and emphatically individual and personal; in all these qualities he is matched by Mr. Graham. The partition comes not from the fault of either man, but because of their merits and the individuality of their characters. Rigby Graham is rather an artist than an illustrator, who uses his text as a starting point for free flight, as a means of inspiration, and he has produced a series of drawings that illuminate the poems essentially because that is where they had their origin. The cerebral content of the drawing is often more abstruse than that of the poem. The artist is perhaps most at ease in his delightful drawings of domestic animals and of wild birds.

Joan Hassall is an artist of a different nature. She is a born illustrator, content to serve her author, but by no means subservient; she feels the limitations of illustration rather as essential discipline than confining restriction, and within these bounds

extends and implements the author's vision. This is the reason why she has been able to illustrate books of quite diverse character, as different as *Cranford* and Eric Linklater's *Sealskin Trousers*, with consistent success, as well as to produce decorative head-pieces and ornaments. Despite the work she has done in other fields—in Christmas and greeting cards, covers, and devices—Joan Hassall is essentially a bookwoman, with an instinctive understanding of the character, the needs, and the possibilities of books.

In *The Wood Engravings of Joan Hassall*, Ruari McLean has gathered together nearly two hundred of the artist's engravings, and has arranged them in chronological order to show the development of her technique—a development evident rather in detail than in change of character, for Miss Hassall's engraving was remarkably mature from the beginning. The book shows that she is not a great artist, but she is always a delightful one, with a direct and yet delicate statement, and a strong sense of atmosphere. It is very good to be able to see her work collected together.

SEÁN JENNETT

AMBASSADOR FOR OIL. *The Life and Times of the First Lord Cadman. By John Rowland and the Second Lord Cadman.* London, Herbert Jenkins Limited, 1960, 215 net.

A biography of an outstanding leader in the international petroleum industry between the two World Wars is of historical importance, for petroleum has played such a vital part in world affairs throughout the twentieth century. This book can only give part of this fascinating story, for John Cadman's achievements were not only in oil but in the sphere of education and science, in which he played a significant rôle.

John Cadman decided to follow the same profession as his father, a well-known mining engineer, and commenced his career in the coal industry. His father's interest and enthusiasm in the development of technical education was another factor influencing his early career. He showed from an early age that he possessed the quality of combining the practical and academic with a remarkable range of interest. His association with his two friends, Mr. J. T. Stobbs, an organizer of Staffordshire County Mining Classes, and Walcot Gibson, a Government Geologist, enabled him to pursue his interest in education and science prior to his appointment as Professor of Mining at the University of Birmingham, an interest which can with some justification be considered as the groundwork for the establishment of the North Staffordshire University.

As a Government Inspector of Mines first in Scotland and then in the Midlands, he displayed a breadth of interest later to result in his being appointed as the Government Official responsible for Mines in the Colony of Trinidad and Tobago. Here he was first introduced to the problems of petroleum, at a time when the international oil industry, as it has now become, was in its infancy. His work in Trinidad was fearless and he displayed there a remarkable faculty for achieving results under difficult diplomatic conditions.

On his return from Trinidad, he took up the appointment of Professor of Mining at the University of Birmingham and his name was by then familiar throughout the world of liquid and solid fuels. From then on and especially with the onset of war, the problems of oil absorbed a great part of his activities.

By the end of the First World War, his widespread duties, including that of technical adviser on oil to the British Government, brought about an obvious break in his work as Professor of Mining at Birmingham University, and it was not long before he joined the Anglo-Persian Oil Company, where he soon became Director and later Chairman, and which provided the main focus of his energy for the last twenty years of his life.

In addition to his work as Chairman of two great oil companies, Lord Cadman

undertook Government work as Chairman of the Committees investigating the work of Imperial Airways, the organization of the Post Office and the problems in connection with the inauguration of television in this country. This important and readable book rightly portrays him as a man of great energy and honesty of purpose, ready to undertake more work than would normally be expected from any one person.

The authors have had so wide a field to cover that it is perhaps not surprising that one should detect omissions: amongst them one which can most appropriately be supplied here, by recalling Lord Cadman's association, as a Member of Council, Vice-President and lecturer, with this Society, which commemorates his name in a periodical lecture devoted to coal and coal-mining.

PHILIP SOUTHWELL

ATOMIC ENERGY IN THE SOVIET UNION. By *A. Kramish*. London, O.U.P., 1960.
27s 6d net

This book is a striking attempt by a member of the Rand Corporation Research Study Group (U.S.A.) to assess the development of atomic energy projects in the U.S.S.R. In effect it is an up-to-date version of earlier reports submitted to the U.S.A. Air Force. It is based not on first hand knowledge, but on a systematic analysis of thousands of issues of Soviet newspapers and technical journals. It is essentially a clever piece of detective work and is a complete eye-opener. Its outstanding result is to underline the remarkable and vast technical achievements already reached in the U.S.S.R. There is a grudging admiration expressed throughout, yet a very real recognition of immense and rapid achievement. The book is a really objective and impartial assessment and will excite and astonish the professional physicist, chemist and atomic engineer, and it also offers much food for thought to the politician and administrator.

Our popular press has long been conditioned to give the impression that atomic research in the U.S.S.R. was always lamely behind that of the U.S.A. and Great Britain, often suggesting that any success depended largely on some notable defections in the past. This book shows that nothing could be further from the truth. On page 30 we read the conclusion that up to about June, 1941, the U.S.A. and the U.S.S.R. 'were progressing toward important achievement in nuclear physics at about the same equal pace'. Indeed it was only the German military attack which temporarily halted the Russian developments. Yet evidence is adduced to show that in 1943 the matter was again taken up. Then later, surprisingly enough, it is shown (p. 144) that Soviet scientists must be credited with putting into operation the *first* atomic power plant for delivering electricity to a community, albeit the power was only 5,000 kilowatts. Attention is drawn to the fact that atomic fuels are essentially 'packaged power', easy to transport, and that in remote regions such as the new valuable diamond mines in Yakuts (near the Arctic Circle) a small atomic energy plant is highly economical because of high transportation costs of other fuels. A remarkable development indeed is the work going on to create small atomic energy plants, transportable on tractors, and movable from region to region; an arrangement ideal for mining exploration in remote locations.

Whilst clearly the many large Russian atomic energy reactors must be producing a formidable stock-pile of atom bombs, yet parallel with this is an extensive development of the peaceful uses of atomic energy. Radio-isotopes are being produced and used on a grand scale in science, industry and medicine. In fact, evidence is given that something like 10,000 packages of radio-isotopes were distributed in the U.S.S.R. in 1957; something closely similar to the American figure. There appear to be over a dozen large electromagnetic isotope separators in operation. A notable development is the projected preparation of 'atomic batteries' made of strontium-90 for sputniks. It is stated that such a battery, weighing some 2 cwts, can deliver

100 watts. Strontium maintains its power for a long time and after twenty-seven years it still gives half its original output.

It is to be noted that an extensive use of radio-isotopes implies the existence, alongside, of a highly developed electronic instrumentation industry for exploiting their use. It is estimated that radio-isotopes used in industry saved the national economy £100 million in 1957.

The book devotes some space to sources of uranium, graphite and heavy water in the U.S.S.R., all of which makes fascinating reading to the specialist. The organization of the science institutes and the personalities involved are examined in much detail. One is surprised to learn that the MIFI institute is as big as the Massachusetts Institute of Technology. New atomic cities have sprung up and they are on a grand scale. On one site, the preparatory installation in 1958 alone cost some £20 million. There is under construction a new city, Akademgrad, which will house 10,000 people. These new science towns are a remarkable development.

At the same time massive developments in high-energy accelerating machines are in progress, and the U.S.A. and U.S.S.R. are racing frantically (for prestige reasons, one surmises) to decide who shall have the bigger machines. Until 1956 the Dubna phasotron was the largest of its type, then the California bevatron passed it. Now a 50,000 million volt machine is under construction in the U.S.S.R. and for the time the Russians will take the lead. Such machines have as much steel in them as there is in a heavy cruiser.

Thermo-nuclear research is described in the book and in this field it is possible that the Russians are in the lead.

The book gives ample evidence that the U.S.S.R. has a vast, highly organized and brilliantly led atomic-energy industry. It is an industry intensely devoted to every possible phase of the applications of atomic energy. An obvious conclusion is that Russian universities must be turning out great numbers of admirably trained nuclear physicists.

This book deserves to be widely read.

S. TOLANSKY

LIBRARY ADDITIONS

Fellows and Associates are reminded that they may borrow up to five books at a time from the Library and retain them for a month. Members living outside London may borrow books by post. Books sent by post are despatched at the cost of the Society and returned at the cost of the borrower. Books marked with an asterisk are part of the reference library, and not normally available for loan.

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FROM THE JOURNAL OF 1860

VOLUME VIII. 9th November

VILLAGE INSTITUTIONS

(From a paper by the Revd. John Bacon, of Woodlands, Berkshire, contributed to the Conference of the Southern Counties Adult Education Society held at Warminster on 2nd and 3rd October, with Dean Hook of Chichester presiding.)

The education of the agricultural poor is difficult. The early age at which they are removed from school almost neutralises its benefits; our only chance, therefore, is with the adult. The trial has been made with varying success by night schools; their benefits are not limited to the learning gained by the adult. Let us inquire not merely what he has gained, but from what he has been withdrawn? His daily life is known—his labour done, what has he, poor fellow, to turn to? In winter, if he is happily married, and more than usually domestic, his cottage may shelter him till he goes to bed; but otherwise, if hired for the year, a carter's boy, 'fagger', or shepherd, his only shelter is the dark loft common to all, where the best of masters cannot allow a candle, or a fire to dry his wet-through clothes. What wonder he betakes him to the alehouse—the fruitful source of misery and sin; and when he cannot pay, or may not run in debt, what becomes of him then? He has no interests, no resources, but such as degenerate and corrupt. Has the night school won him from these accustomed evil propensities?—the love of learning A, B, C—of dully hammering over what he cannot understand? Try something in addition more attractive. Till he can read sufficiently the Lending Library is useless; and for those who can read well it is not enough. They complain that they have read all the books. For both readers and non-readers let there be a reading-room. The one may read, both may be read to. The matter read may include the easiest popular literature of the day, simple and attractive serials, newspapers, and amusing books. Tempt him to learn, and then improve his learning. The public reader and the room may be difficult to find; yet, where there is a clergyman and a school-room, their wants may be supplied. Wherever a proprietor resides let his help be sought, and now and then an intelligent farmer will give aid, pecuniary or personal.

Let the scheme be popular in constitution. Scientific subjects can be so treated as to interest the rustics. Natural history they have an inherent love for. In the writer's parish, sparse and poor, without a village or hamlet, his children's love for butterflies and caterpillars has infected many a smock-frock. Larvae and chrysalides are brought up to the parsonage, and the greatest curiosity is evinced to see their changes. The habits and the culture of plants are specially studied by country folk. The shepherds know the stars, though not their names, better than many a gentleman or lady, and long to hear about them.

The writer has lectured an old woman on the planetary orbits, with a chalk-drawn diagram on her round elm table, till the spectacles have nearly fallen from her nose in wonder. And she has learned that it was not profane to doubt the sun's correctness

as a timekeeper, which she has for years secretly suspected as she daily watched his shadow-line on the brick floor at noon, and turned to ask her favourite clock if he was right.

Sitting in a cottage in a thunderstorm, the interval between the flash and clap has led to explanations which have rivetted attention. That remarkable explosion in the air which was heard on the 17th January last, caused great astonishment and curiosity among the rustics here. They listened eagerly to what was said about aerolites; and, if they did not understand it all, it made them more inquisitive, and gave the very opening we want—it brushed away that solid indifference which generally bars access to them. In another village a more formal lecture was given to the members of the reading-room on Hydrostatics, hiding of course the name. The interest was apparent, and next day three of the rustic audience began to try their hands at making a peculiar kind of waterclock.

Some Activities of Other Societies and Organizations

MEETINGS

- TUES. 1 NOV. Royal Commonwealth Society, Northumberland Avenue, W.C.2. 7.30 p.m. *Sir Gerald Kelly remembers.*
- WED. 2 NOV. Engineers, Junior Institution of, at James Watt Memorial Institute, Gt. Charles Street, Birmingham. 7 p.m. T. McMillan: *Motorway M1.* Newcomen Society, at Science Museum, S.W.7. 5.30 p.m. L. T. C. Rolt: *The Talybys railway.* Radio Engineers, British Institution of, at 9 Bedford Square, W.C.1. 6.30 p.m. Discussion: *Radar—pulse or C.W.*
- THURS. 3 NOV. Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. H. F. Oppenheimer: *Talk on South Africa.* University of London, at University College, W.C.1. 1.15 p.m. Professor C. M. Robertson: *The Parthenon frieze.*
- FRI. 4 NOV. Royal Institution, Albemarle Street, W.1. 6. Porter: *Very fast chemical reactions.*
- SAT. 5 NOV. Horniman Museum, at London Road, S.E.23. 2.30 p.m. D. E. Owen: *Treasures in museums.*
- MON. 7 NOV. Royal Geographical Society, Kensington Gore, S.W.7. 8.30 p.m. Professor M. E. L. Mallowan: *Discoveries at Ur.*
- MON. WED. 7 & 9 NOV. University of London, at Senate House, W.C.1. 5.30 p.m. Professor John Butt: *Johnson and Boswell as biographers.*
- TUES. 8 NOV. Civil Engineers, Institution of, at Great George Street, S.W.1. 5.30 p.m. Ian Davidson: *Some contributions from nuclear power to engineering practice.*
- WED. & THURS. 9 & 10 NOV. Mechanical Engineers, Institution of, at 1 Birdcage Walk, S.W.1. *Symposium on the use of secondary surfaces for heat transfer with clean gases.*
- WED. 9, 16 & 23 NOV. Victoria & Albert Museum, S.W.7. 6.15 p.m. John Pope-Hennessy: *The sculptures of Michelangelo.*
- THURS. 10 NOV. Civil Engineers, Institution of, at Great George Street, S.W.1. 5.30 p.m. Discussion: *The economics of airlifts for major construction.* Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. Walter Hood: *A T.U.C. "trouble shooter" in Africa.* University of London, at University College, W.C.1. 5.30 p.m. Richard Lewelyn Davies: *The education of an architect.*
- FRI. 11 NOV. Royal Institution, Albemarle Street, W.1. R. J. Harrison: *Experiments with diving seals.*
- MON. 14 NOV. Commonwealth Institute, S.W.7. 5.45 p.m. M. A. Wellham: *Exploring Africa by motor caravan.* Engineers, Junior Institution of, at Livesey Clegg House, 44 Union Street, Sheffield 1. 7.30 p.m. A. Haddock: *Some recent developments in public electricity supply.* Royal Geographical Society, Kensington Gore, S.W.7. 8.30 p.m. Max Eiselein: *The ascent of Dhaulagiri.* Transport, Institute of, at 66 Portland Place, W.1. 5.45 p.m. S. A. Finnis: *The handling of freight traffic between ship and shore.*
- TUES. 15 NOV. Locomotive Engineers, Institution of, at 1 Birdcage Walk, S.W.1. 5.30 p.m. T. A. Eames: *Refrigerated transport on railways.*
- TUES., WED. 15 & 16 NOV. University of London, at Birkbeck College, W.C.1. 5 p.m. Professor J. Wyart: *Crystallography.*
- TUES., THURS. & FRI. 15, 17 & 18 NOV. University of London, at University College, W.C.1. 5.30 p.m. Professor E. E. Evans: *Geography.*
- WED., THURS. & FRI. 16, 17 & 18 NOV. University of London, at University College, W.C.1. 5.30 p.m. Professor R. J. Forbes: *History and philosophy of science.*
- WED. 16 NOV. Radio Engineers, British Institution of, at 9 Bedford Square, W.C.1. 6.30 p.m. Lt. Col. I. W. Peck: *Digital computing elements for instructional use.*
- THURS. 17 NOV. Commonwealth Institute, S.W.7. 5.45 p.m. A. Trevor Campbell: *New Zealand and the Pacific.* Royal Anthropological Institute, at 21 Bedford Square, W.C.1. 5.30 p.m. J. H. M. Middleton: *Land and settlement in Zanibar.* Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. Viscount Boyd of Merton: *The Pacific territories.*
- FRI. 18 NOV. Royal Institution, Albemarle Street, W.1. D. E. Broadbent: *The perception of speech.*
- SAT. 19 NOV. Horniman Museum, at London Road, S.E.23. 3.30 p.m. John Hanbury-Tracy: *Eastern Tibet.*
- MON., TUES., THURS. 21, 22 & 24 NOV. University of London, at King's College, W.C.2. 5.30 p.m. A. N. L. Munby: *The cult of the autograph letter.*
- MON. 22 NOV. Royal Geographical Society, Kensington Gore, S.W.7. 5 p.m. R. J. Harrison Church: *Problems and development of the dry zone of West Africa.*
- WED. 23 NOV. Radio Engineers, British Institution of, at 9 Bedford Square, W.C.1. 6.30 p.m. F. H. Brittain: *Objective and subjective requirements for loudspeakers.*
- THURS. 24 NOV. Commonwealth Institute, S.W.7. 5.45 p.m. M. Khodabax: *The island of Mauritius.* Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. Professor D. W. Brogan: *A new look in American politics.*
- FRI. 25 NOV. Royal Institution, Albemarle Street, W.1. Arthur Hedley: *Frédéric Chopin: the man and the artist.*
- SAT. 26 NOV. Horniman Museum, at London Road, S.E.23. 3.30 p.m. A. J. Cain: *The Oxford University expedition to British Guiana.*
- MON. 28 NOV. Commonwealth Institute, S.W.7. 5.45 p.m. Major R. Thomas: *A portrait of Malaya.* Royal Geographical Society, Kensington Gore, S.W.7. 8.30 p.m. R. M. L. Mason and A. R. Hanbury-Tenison: *Across the South American continent.*
- WED. 30 NOV. Victoria & Albert Museum, S.W.7. 6.15 p.m. Oliver Millar: *The Restoration and the arts.*

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